LIBRARY OF CONGRESS
COPYRIGHT
JUL 5 1887
CITY OF WASHINGTON

PRICE 15 CENTS

JULY 2, 1887.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXII. REGULAR EDITION NO. 601.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON, MASS.

CONTENTS.

Editorial Summary.

United States Government Building Practice.—V.

Safe-Building.—XVII.

Communications.

Notes and Clippings.

Trade Surveys.

ILLUSTRATIONS.

House of Robert Goelet, Esq., Newport, R. I.
(Gelatine Print issued only with Imperial Edition.)

A Clock-Tower.

Astronomical Observatory, Northfield, Minn

Citizens' Nat'l Bank, Towanda, Pa.

United States Post-Office and Court-House, Montpelier, Vt.

House at Haverhill, Mass.

Competitive Design for House of Little Wanderers, Boston, Mass.

House at Poughkeepsie, N. Y.

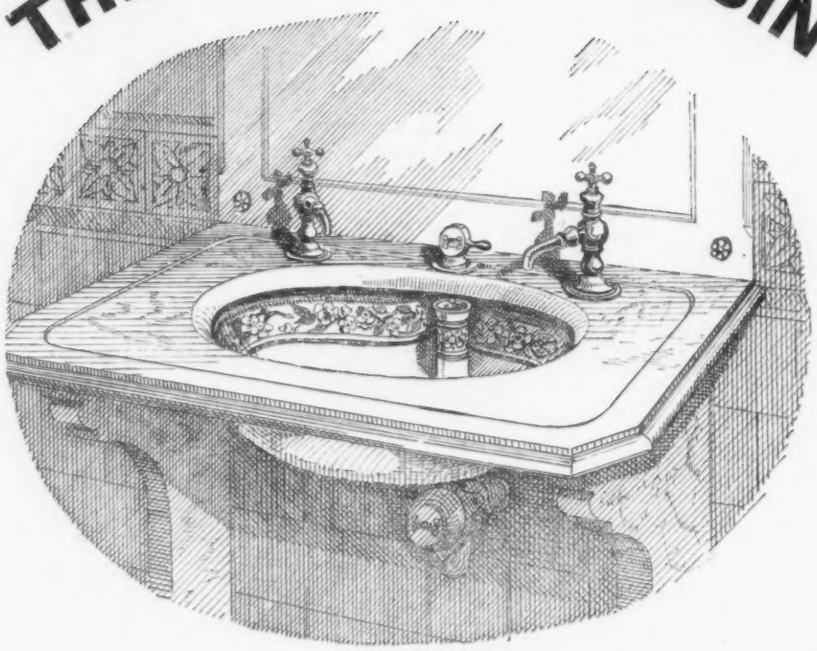
SANITAS BASIN LIFT.

+ PLUMBING +
SANITAS
+ APPLIANCES +

PLAN OF BASIN.

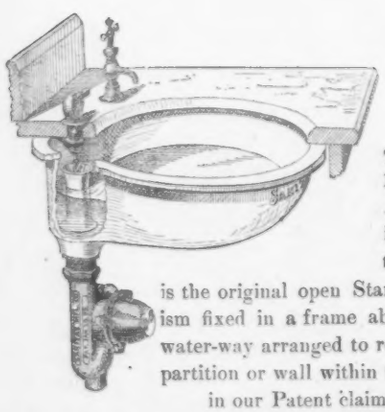
THE SANITAS BASIN

QUICK EMPTYING, ORNAMENTAL.

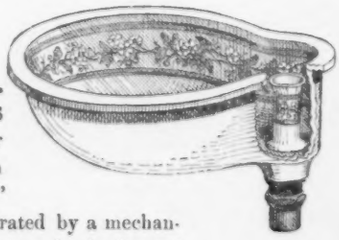


STAND-PIPE OVERFLOW.

WITH SANITAS TRAP ATTACHED.



CAUTION !



THE GREAT AND UNIVERSALLY ACKNOWLEDGED MERITS of the SANITAS Appliances have given rise to a number of inferior imitations & infringements, against the use of which the public are hereby cautioned. The "Sanitas" is the original open Stand-pipe Basin, having a removable stand-pipe, operated by a mechanism fixed in a frame above, and the "Sanitas" Trap, the only one having the horizontal water-way arranged to render the trap self-scouring and anti-siphonic, and having a reflecting partition or wall within the body. All those who manufacture or use these features, or others in our Patent claims, in any form, are infringers and will be prosecuted for damages.

THE "SANITAS" MANUFACTURING CO., 207 TREMONT ST., BOSTON, MASS.

AGENTS: For N. Y. City and vicinity, Miller & Coates, 279 Pearl St., N. Y. For New England, C. G. Cunningham, 207 Tremont St., Boston

T. H. DUGGAN, 141 Dartmouth Street, BOSTON, MASS. TELEPHONE, 4165 } Will execute anywhere, in first-class manner, small or large contracts for **PLUMBING**

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXII. Copyright, 1887, by TICKNOR & COMPANY, Boston, Mass. No. 601.

JULY 2, 1887.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

SUMMARY: —
Underwriters and Architects. — The Movement against the South Kensington Method of Instruction in Art. — The Opinions of Sir John Millais, Mr. Ruskin and Mr. Morris. — Turret Forts. — Parcel-post Service with Mexico and the West Indies. 1
UNITED STATES GOVERNMENT BUILDING PRACTICE. — V. . . . 3
THE ILLUSTRATIONS: —
House of Robert Goelet, Esq., Newport, R. I. — A Clock-Tower. — Astronomical Observatory, Northfield, Minn. — National Bank, Towanda, Pa. — U. S. Post-office and Court-house, Montpelier, Vt. — House at Haverhill, Mass. — Competitive Design for House for Little Wanderers, Boston Mass. — House, Poughkeepsie, N. Y. 7
SAFE BUILDING. — XVII. 7
COMMUNICATIONS: —
The Practical Value of Grouting. — Rector Pierson, First President of Yale College. 11
NOTES AND CLIPPINGS. 12
TRADE SURVEYS. 12

WE are accustomed to finding attacks on architects in the insurance journals, and, knowing the tendency of human nature to blame others for the misfortunes brought about by one's own folly, have generally been disposed to overlook them, but we are sorry to find that *Fire and Water*, the honest and able representative of the fire-engineers' views of such subjects, has unthinkingly fallen into a similar way of talking. In a recent article on "Fire Hazard and Architecture," the editor, after deploring the universal use of wood finish in place of more resisting materials, says that "owners generally want a little money to go a good way and are willing to sacrifice strength for show, and architects and builders are very willing to gratify them in this respect," and concludes by putting "most of the blame for the combustibility of our structures on the builders and architects, who, as it says, "make building a study and should know better." This proposition has a specious sound which is very likely to deceive the ordinary writer, as it seems to have done the author of it, and it ought to be controverted without delay. We will leave the builders to fight their own battles, but in behalf of the architects, who, as we are informed, "ought to know better" than to design six-story buildings with wooden roofs, we should like to inquire if there is any respectable architect in the country who does not know that such buildings are bad fire-risks, or who is not perfectly acquainted with the methods of increasing their resistance to conflagration to any extent? After thus holding up the architects to reprobation, *Fire and Water* proceeds to assert that "Fireproof construction is the best in the long run, on the score of economy both to the owners and the public." This maxim may do for firemen, but architects and owners cannot dispose in such an easy way of the problems presented to them. We venture to say, for example, that if the editor of *Fire and Water* wished to improve a lot on a village street, he would, however excellent his principles, regard an architect who told him that the best and most prudent way of doing so would be to build a fireproof structure in the middle of it as little short of a lunatic. And he would be right, for a heavy, expensive structure which could not be rented for a fair interest on its cost, and could not be removed without great loss when circumstances made it advisable to utilize the land in a different way, would be a most foolish investment, and owners, with reason, expect architects to think quite as much of planning buildings which will bring in a good return on the capital locked up in them as of making them satisfactory to the underwriters. With this consideration in view, there are few architects who do not try to contrive even their cheapest buildings so as to resist fire as well as can be done without sacrificing other interests of greater importance to the owner. Whether rightly or wrongly, many real-estate proprietors have an idea that underwriters charge them a high price for insuring them against ordinary fire-risks, and then, for their own profit, try to take advantage of any improvement or alteration on the estate to work upon the feelings of the architect, so as to get him surreptitiously, at the owner's expense, to convert, for the benefit of the underwriters, the bad risk, which they are paid for insuring, into a good risk without change of rates. It is true that architects are usually willing to incur something of their share of this suspicion for the sake of advocating what they think to be good principles of building, but it is too much to expect them to throw overboard every other consideration of prudence and economy for the sake of promoting the interest of the underwriters, who might, with advantage, recall occasionally the fact that all the important improvements in the art of fire-resisting construction have been devised either by architects or the officers of the mill mutual insurance companies; that in the practice of this art the architects of America stand at the head of the whole world, and that the rules and regulations which are now feebly put forward by underwriters' associations in our larger cities have never yet, so far as we have seen, contained a single suggestion or warning that had not been familiar to all respectable architects for many years, while a good part of the rules which have come under our observation are mangled and absurdly misunderstood imitations of maxims drawn up for various occasions by architects and builders.

WHERE is in England just now a certain movement against the South Kensington system, as it is called, of teaching art, which has called forth much talk on both sides. Whether good or bad, the system has, through the affiliated schools all over the kingdom, taught by graduates of the parent institution, and supplied with examples from the unrivalled Kensington collections, an immense influence, and South-Kensingtonism, to call by its common name a familiarity with forms of art, is perhaps one of the most striking features of English life at the present day. No doubt the teaching of the school, under some instructors, has fallen into the dry archæological drill, so fatal to artistic fancy, which the English are naturally rather inclined to substitute for the more difficult education of the imagination, and the sarcasms about the wooden-looking designs "in the Græco-Italian style," or the "plaques ornamented with Hispano-Moresque patterns in relief," which one often hears when the school is spoken of, are not without foundation; but it is certain that the best of the work done at the schools of art under the direction of the South Kensington authorities is often exquisitely beautiful, while the systematic and uniform dissemination of the simplest principles of taste, and, still more, of good models, has done wonders for the artistic education of the English people. Whether it is not time now for something better is, however, a fair question, and not long ago a violent attack was made on the whole system by a Mr. Partington, who was in turn effectively answered by Mr. Pearson, the head of the admirable school of art in Manchester. Not content with his own presentation of his case, Mr. Pearson asked for the opinion on the subject of some of the most noted artists in England, among others of Sir John Everett Millais, Mr. Ruskin and Mr. Wallam Morris.

SIR JOHN MILLAIS, one of the greatest of modern painters, who has won his place by conscientious work, replied to Mr. Pearson's note by remarking that the complaints of an art-student about the irksomeness of the drill which he had to go through always seemed to him to resemble the lamentations of a bad workman over the faults of his tools. After the preliminary training of the hand and eye, the best teaching in art was to be obtained from the study of fine examples, which South Kensington provided for its pupils with a generosity unknown to the students of past generations, and he advised persons who wished to learn art not to trouble themselves about the merits or demerits of the official systems, but to be thankful for the advantages offered them, and to work "steadily and humbly" through the preliminary drill, however tiresome it might be. As to the influence of the system in developing great artists, he thought no discussion was necessary. Great artists were not produced from ordinary material by any process of education. They might be somewhat hindered or advanced by bad or good training, but beyond the first steps

they must depend upon themselves, working out their progress by their own efforts and judgment.

AN appeal to Mr. Ruskin on matters of art always presents the sort of interest which attaches to the process of stirring up a bear with a long pole, and Mr. Pearson seems to have evoked a characteristic growl. "If the twenty-six students," said the great critic, "on whose behalf you sign will subscribe each of them a shilling fee for my opinion, let them buy my '*Laws of Fesolé*,' and lend the book to each other and do what it bids until they begin to understand a little what it means." As a person could hardly do what a book bade him without understanding what it meant, we infer that lending Mr. Ruskin's writings about tends to the elucidation of their contents, and regret that we have not been able to lend more extensively the concluding portion of Mr. Ruskin's epistle, in which he observed that, notwithstanding the assistance to be derived from circulating the "*Laws of Fesolé*," it would be impossible "for Manchester, or any towns the least like Manchester, to have schools of art in them at all." The reason of this singular discrimination of the Muses against Manchester and similar towns was, as he informed Mr. Pearson from "very sure and stern knowledge," that "art could not be taught by fouling the skies over their heads and stealing their drink from other lands." We cannot imagine that Mr. Pearson steals his drink or fouls the sky, and have therefore concluded that this must be a figurative expression, intended to imply that students cannot draw or paint so well in a hazy atmosphere like that of Manchester, and that the disorders caused by drinking water from the town pump are more favorable to artistic inspiration than the peace of the digestive organs which is promoted by the use of a purer beverage; but beyond this translation of Mr. Ruskin's rhetoric into plain English our intuition has not been able to carry us, and we leave the task for persons of more penetration.

MR. MORRIS'S reply, like everything that he writes, was clear and practical, and, moreover, strikingly similar in ideas to that of Sir John Millais. "No system," said he, "could teach a man to be an original designer," but a man who had the capacity in him might have his labor of learning shortened by availing himself of the experience of ages. In his opinion, the proper business of the public schools of art was not to try to create professional designers, but to teach people to draw correctly and to color tolerably well, and to understand something of the history of the arts, so as to appreciate what they saw about them. Such training as this would, he thought, be useful and pleasant for every one to possess, and would, by the cultivation of taste, promote that widespread feeling for art which must exist before great artists can be produced. To attempt more than this in such schools and to substitute the teaching of style for the training of eye and hand, he thought to be injurious both to the student and the public, and "sure to end in failure of one kind or another."

THE future course of the art of fortification seems to lie in the direction of providing impervious boxes, just large enough to contain one or two guns, at the commanding points of a given coast, using each of these, like the keeps of the mediæval castles, as the nucleus of a group of earthworks. A stronghold planned in this way would fulfil pretty well the Irishman's idea of a perfect fortification, in which, if an attacking party got over the ramparts it would find itself on the same side that it started from; for, if hard pressed, the defenders of a line of earthworks could take refuge in the impregnable turret, while the capture of the exterior line would only expose the captors to annihilation from the turret within. Already several turret citadels have been constructed, and we remember seeing some curious objects at the entrance to a harbor in North Holland, much resembling a pair of very large turtles, which proved to be two of the strongest forts in Europe. These fortresses, like the others of the sort which have been constructed, were simply flat domes of iron, revolving on a circular foundation, and having two or three port-holes in each, closed by a shutter when not in use, and serving for an equal number of enormously heavy guns. The domes were thick enough to be practically impenetrable, while the projectiles fired from them at a vessel entering the harbor which they guarded would pierce the heaviest armor yet put on a ship. Since the building of these forts at the Helder, many trials have been made to determine the best kind and thickness of metal to be used in similar ones, and the new system, which, since any weight of metal can be used in land turrets, while the thickness of the armor of a ship is limited by the buoyancy of the hull, offers for the first time a means of defence capable of resisting any known method of attack, is likely to become general.

THE immense cost of a fort of this kind, if made of forged iron or steel, may be greatly reduced, as Sir Henry Bessemer suggests, by casting it in place. He proposes to construct, on the spot where the fort is to stand, a core, by piling up earth and sand in the requisite form; and then to build around it a brick wall, held together by iron bands, and carrying the moulds for the exterior. Around the wall are to be placed the melting furnaces, arranged for charges of twenty tons, and each capable of melting eighteen charges a day. With four such furnaces a ton of melted steel per minute could be poured into the mould, and a dome weighing a thousand tons cast in less than a day. As the mass would need no transportation, it might be made much heavier even than this, and, upon cooling, would require nothing more than the removal of the core, which would allow it to settle down upon the cannon-balls intended to serve as wheels. The port-holes would be cast in the mass, and would, of course, need little or no finishing, and the cost of a thousand tons of steel, with Bessemer ingots at half-a-cent a pound, would be a mere trifle, compared with that of forged plates, riveted together.

THE announcement is made that the Post-Office Department has established a parcel-post service between the United States and Mexico, and certain islands in the West Indies, by which packages weighing not more than four pounds and a fraction, by which we suppose is meant two kilogrammes, can be sent through the mails, and delivered to the person addressed, upon payment of the customs dues. We are glad that so much has been accomplished, and hope that the extraordinary facilities enjoyed by those persons who have business with Mexico will call the attention of their neighbors, whose business relations are with other countries, to the inconveniences under which their transactions are carried on, as compared with the postal facilities enjoyed by the inhabitants of all other civilized countries. The absence of a parcel-post service, both inland and foreign, is a disgrace to the Government of the United States. The Postmaster General seems, from his annual report, to have made a small effort to give his fellow-citizens such use of the mails as is enjoyed by people abroad, but, as he naïvely says, the express companies opposed the idea so strongly that he was obliged to abandon it. It is not unnatural that the express companies should oppose a plan for transporting packages by the mails at a small fraction of the rates which they demand for the same service; but there is something to be considered in the administration of a public office besides the interest of the express companies; and their opposition ought not to be regarded for a moment in comparison with the great benefits which would be conferred upon the people of the United States by such a postal service as, for instance, that of Germany. The greatest need of this country is, and will be for many years, cheap transportation. For want of this the California farmers are compelled every year to feed their pigs with hundreds of thousands of dollars' worth of fruit worthy of the Gardens of the Hesperides, while the poor working people of Chicago and New York, to whom a Los Angeles plum, or a Florida pineapple, would be a taste of Paradise, must go without everything except the great staple articles, on account of the enormous cost of getting it. In Germany, supposing it to be provided with such a varied climate as ours, the fruit-grower would distribute broadcast in the cities return postal-cards, containing blank orders for four, five or six pound boxes of apricots, grapes, fresh figs or oranges, which, on receipt of the slip, with money-order, would be delivered by the next mail at the house of the consumer. Tons of fresh herrings, butter, and other articles are distributed daily in this way all over Germany, to the advantage of the fishermen and farmers, who find a sure market for the product of their toil, as well as of the citizen, who finds his tastes satisfied at a small cost, and of the public treasury, which can transport such articles profitably at a small fraction of express charges.

UNITED STATES GOVERNMENT BUILDING PRACTICE.[1] — V.

Native Bridge on the Sutlej. Hindustan.
after sketch by Wm. Simpson

THE walls of buildings are generally built of stone and brick: temporary buildings only, such as wards for marine-hospitals, quarantine-sheds for cattle, etc., are built of wood.

In stone buildings, usually, the facing only of exterior walls is stone, the ashlar varying in depth from 6″ and 10″ to 12″ and 16″ in alternate courses: the backing of exterior walls and all interior walls are built of brick: interior piers are usually built of brick, with bond-stones, except in cases where great strength is required when they are built of dressed and coursed stonework.

The stone and brick work of a building is always put under contract, after advertisement and competitive bids have been received. For small buildings the stone and brick work is usually let in one contract, for furnishing all materials and putting the masonry in place complete: this is always done when the facing of the body of the walls is brick and the trimmings, belt-courses, cornices, etc., are stone. For larger buildings costing in the aggregate $100,000 or more, where all the exposed facing of walls is of stone, it has been the practice of late years to make one contract for furnishing and setting the stone complete, and a separate contract for the brickwork.

The stone, which was Buena Vista sandstone for the Chicago Custom House and granite for the New York Post-Office, Boston Sub-Treasury and Post-Office and Cincinnati, Hartford, Philadelphia and St. Louis Custom-Houses, was purchased, after advertisement, by the cubic foot in the rough, allowing what was called "quarry measure;" the price included delivery at the site of the building; and the cutting was done under what was called the "fifteen per cent contracts." By "quarry measure" was meant the adding of one inch for granite and one-half inch for sandstone to the dimensions of the stone for each cut-face joint, bed and build; where brick backing came against a stone no allowance was made: this system would always make a stone, if granite, two inches higher, generally two inches longer and one inch wider than the net dimensions of the stone, and payment was made per cubic foot of quarry measure so determined. Quarry measure has been entirely abandoned and was only allowed on the buildings above mentioned: it was a source of almost endless dispute between the office and contractors. The basis of the fifteen per cent contracts was, that the contractor should use all due diligence in cutting the stone in a first-class manner, and that the Government should pay him for the actual cost of the cutting, and fifteen per cent of the actual cost in addition thereto, which was to be his profit, and as this was a fair, reasonable and assured profit it was presumed the contractor would have no object in slighting any portion of the work. Practically the work was of a finer grade and the cutting better executed than usual, but it cost about twice as much, and was unnecessarily prolonged.

With the exception of the five buildings before mentioned, and until the last few years, it was the practice to make a contract for furnishing and delivering the stone at the building cut ready for setting. The setting of the stone and the furnishing and laying the brick were put in a separate contract. It is now the practice to make a contract for furnishing, cutting and setting the stone in the building complete.

Ordinary carving, bas-relief work, etc., are included in the contract for stone; but the modelling and carving of statuary are contracted for separately.

Bidders are frequently required to submit a price per cubic foot for dimension stone in the rough, in case an extension of the building may be contemplated or additional stone required for any other cause.

The Government has used almost all the prominent building-stones in the United States: red and gray granites, marble, limestone, sandstone, and brownstone. Among the granites used may be mentioned: Hallowell, Fox Island, Dix Island, and Hurricane Island, Me., Cape Ann and Quincy, Mass., Concord, N. H., Richmond, Va., Woodstock, Md., Stone Mountain, Ga., Middlebrook, Mo., and Platte Cañon, Col., the last two red. Among the limestones: Oolitic, Bedford, Ind., Bowling Green, Ky., Juliet and Lamont, Ill., Onondaga, N. Y., and Fossick from Dickson, Ala. Among the sandstones: Amherst, Berea and Buena Vista, O., Warrensburgh, Mo., Stony Point, Mich., and Armijo, Col. Among the brownstones: Middlesex, Portland, Conn., Potomac, Seneca, Md., and Manassas, Va. Marble has only been used for walls in two buildings, namely: at Knoxville and Memphis, Tenn., from quarries near Knoxville.

All the granites mentioned are very fine building stones: the Virginia and Georgia granites are much lighter in color, finer grained, and more easily worked than the others. Large quantities of the Maine granites have been used, also a considerable amount of the Massachusetts and Virginia granites. Some very fine samples of granite have been received at the office from Waupaca, Wis., but none have been used yet: the color varies from light red to a dark blackish red and it receives a very beautiful polish.

The limestones, brownstones and sandstones are generally of very good qualities: large quantities of the Bedford and Illinois limestones and of the Amherst and Berea sandstones have been used.

The Buena Vista sandstone of Ohio has not proved as good a stone as the others; it is easily broken under a strain and scales and cracks badly under the action of the weather.

SPECIFICATION.

Generally. — The contractor to furnish all the labor and materials (stone, sand, cement, lime and water) and cut and set the stonework as required by the drawings and specification; make the sinkages for and build into the stone all the anchors, cramps, dowels, etc., that may be necessary.

Kind of Stone. — Steps, platforms, door-sills, area-copings, bond-stones, pier-caps, and bearing-stones for columns, girders and trusses will be of granite: a good hard limestone may be used for this purpose if granite is found to be too expensive. Foundations and facings of walls coming in contact with the earth are generally built of granite or limestone, as sandstone is not thought to stand the action of the earth, moisture, etc., as well as the former.

Each bidder is required to submit a sample (12″ x 6″ x 4″) of the stone he proposes to use, one face showing natural fracture and the others the different kinds of cutting, bed-work, face-work, etc., called for.

Explanation of Drawings. — The portions hatched in solid lines on plans and sections indicate stone: the portions hatched in alternate solid and broken lines indicate brick. All the dimension and cut stone is numbered and figured on the drawings and the stone must be cut to the exact sizes, profiles, etc., indicated. Full-size drawings of the moulded work and models of the carved work will be furnished the contractor.

Quality of Stone. — All the stone to be hard and durable, close-grained, of good texture, and free from defects and discolorations other than such as are allowable in first-class work, and to be of the dimensions and designs shown, noted and figured on the drawings: all the exposed stonework above ground-line to be of an even, uniform color.

Quarry. — The quarry from which the stone is proposed to be obtained must be fully opened and developed, and capable of supplying all the stone required within the time named by the bidder: the name and location of the quarry must be stated in the proposal.

Unexposed Walls. — The unexposed walls of buildings and areas below ground-line may be random rubble, squared and coursed masonry, random ashlar, or rock-face coursed ashlar.

Random Rubble. — The random rubble-work to be built solidly through the wall in courses, each course brought to a level every 18″ or 20″ and to have headers of suitable size running through the wall, placed in position before the course is built, every six feet apart; the joints to be not over one-half inch wide.

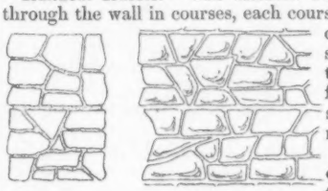


Fig 4.

Coursed Masonry. — The coursed masonry to extend entirely through the wall: the courses may vary in height and the stones in lengths and widths but each course must be level throughout, and the stones must break joint and all the beds, builds and joints must be squared. No stones containing less than three cubic feet to be used, and each course must be bonded by through stones at least every eight feet: the faces of all unexposed stonework to be rough or rock-face and the joints and beds worked true, fair and out of wind, and not to exceed one-half inch thick.

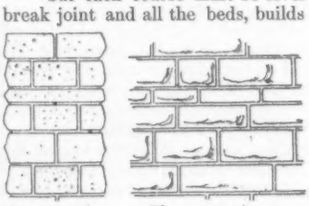


Fig 5.

Squared Masonry. — The squared masonry to be built in the same manner as the coursed masonry, except that the stones are not to be in regular continuous courses and the through bond-stones will be required, one to every square yard of wall. The random ashlar and the rock-face coursed ashlar for unexposed walls to be built in same manner as for exposed walls, except that it is not necessary to have the projection uniform nor pitched off from line of joints.

Piers. — When piers are built of brick they must have cap-stones from 10″ to 12″ thick the full size of the pier, the top surface to be carefully levelled for the bed-plates of columns, girders, etc. to rest upon. Where bond and footing stones are required they must be in

[1] Continued from page 228, number 593.

one piece each, not less than five inches thick, the bond-stone to be the full size of the pier and the footing-stone must have sufficient projection beyond face of pier to give the necessary bearing surface.

Where piers are built of stone, the stones must be of the heights and dimensions figured, each alternate course to be the full size of the pier and the footing and capstones to be in one piece each, not less than ten inches thick. The beds and joints to be not over one-quarter inch thick and to be of first-class bed-work: the exposed faces to be cut similar to the faces of bearing-stones.

Bearing-Stones. — All columns, girders and trusses to have bearing-stones from 10″ to 12″ thick and of sufficient size to distribute the weight so that not more than one hundred and fifty pounds load per square inch shall bear upon the brick-work.

The beds and builds of all cap, bond, footing and bearing stones to be perfectly level, true, fair, out of wind, and to have equal bearing throughout: the sides where coming against brickwork to be pitched off to the required sizes shown on the drawings, so as to form a close joint with the brickwork. The exposed faces to be axed, pean-hammered, or No. 6 cut-work if granite is used; and sawed, rubbed or tooled work if limestone is used.

Exposed Walls. — The exposed walls and superstructure may be faced with random ashlar, rock-face coursed ashlar or dressed ashlar; the water-table, sills, imposts, architraves, friezes, cornices, voussoirs, columns, pilasters, etc., to be finely dressed, cut to the dimensions, designs, profiles, and set in positions plumb and level, as shown on the drawings.

Random Ashlar.— Random ashlar may be used only for facing the basement walls below water-table, and dressed stone for the superstructure, or it may be used for facing the walls of superstructure, parapets, gables, dormers and chimneys; it is to be rock-faced, to have usually 8″ and 12″ beds, and built up solid with proper housings for bond with brick backing; not in regular courses, but having horizontal beds and vertical joints, as indicated by Figure 6; no stone of less than thirty-six square inches on the face to be used.

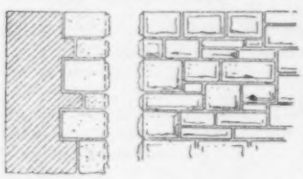


Fig 6.

The beds and joints to be square with face of wall and the rock-facing to be uniform, pitched from, and not to project more than 1″ or 1½″ beyond line of joints, which must all be in the same plane. The angles of buildings and of openings where shown to have 1″ or 2″ wide drove or tooled margin if of limestone, marble, or sandstone, and Number 6 cut or Number 8 cut if of granite. The jambs and reveals of all openings to be dressed similarly to the cut stone of the building. Where quoins are shown at the angles of the buildings and at openings, they are to be dressed similarly to the other cut stone, and to have a bond of from 4″ to 8″ with the random ashlar: the face of quoins may be on the same plane with line of joints, or may have a projection equal to that of the rock-face work. No drill or tool marks to show on any exposed rock-facing.

Rock-face Coursed Ashlar. — This work may be in random heights and lengths, but each course must have the same continuous height throughout, or it may be in regular figured heights and lengths; in such cases it becomes dimension stone, the courses to alternate having beds usually 8″ and 12″ wide. There should be a difference of 4″ in the bed of each alternate course, so that a proper bond may be had with the brick backing.

The jambs, reveals, beds and joints to be dressed square, and the angles to have margins the same as in random ashlar; or, instead of pitching the face off from the joints, if dimension-stone be used, each stone may have a dressed margin all around next the joint.

Dressed Ashlar. — Dressed ashlar to be coursed and jointed, and of the dimensions shown, and the courses to bond with brick-backing the same as rock-faced coursed ashlar. The faces, returns, and reveals of openings to be dressed similarly to the other cut stone in the building. The returns of all coursed ashlar to be equal to the bed of the widest course, and never less than 8″. No joints to show on face of reveal unless the reveal exceeds 16″ in depth and then only in alternate courses, and all ashlar to be thoroughly bonded and to break joint throughout.

Cut Stone. — All stones whose exposed faces are dressed smooth are classed as cut stone, and may be divided into ashlar, moulded and carved work. Stones with straight, square faces, and with a plain straight chamfer only are classed as ashlar; all stones with moulded profiles and curved surfaces are classed as moulded work, and the carved work is the ornamentation on stone made either by incisions or by raising the figures in low relief above the general surface.

CUTTING.

Face Work. — All exposed plain surfaces and mouldings, if of sandstone, to be fine rubbed work; if of limestone or marble, may be rubbed, square-drove, tooled, or bush-hammered, with drove or tooled margins, the tooling to be eight bats to the inch to top of first-story cornice, and six bats to the inch above; if of granite, to be Number 8 cut-work to top of first-story cornice and Number 6 cut above. Where moulded work cannot be easily tooled it is to be finely-rubbed work. The faces of all steps, platforms, and door-sills, which are usually granite, to be No. 6 cut-work properly weathered

Moulded Work. — All the moulded work to be of the dimensions, designs, and profiles shown, cut sharp and clean, in strict accordance with the full-size details. The shafts of pilasters and columns to have flutings and entasies worked as shown, and the beds for same to be worked fine, equal to face-work.

Carving. — All carving shown to be cut to the proper depth of relief, to be fine, bold, spirited, and executed in the most artistic manner in strict accordance with the full-size details and models.

The angles and arrises of all cut-stone work to be sharp, true, and clean.

Beds and Joints. — The beds, builds, and joints of all stonework to be fair, true, out of wind, and have an equal bearing throughout, and to be so worked that when stones are set the joints will not exceed ⅛″ thick for granite and marble, and from $\frac{3}{16}$″ to $\frac{5}{16}$″ for sandstone and limestone.

Backs of Stones. — The backs of ashlar, belt-courses, cornices, voussoirs, etc., to be roughly pointed or pitched off to the depths noted on the drawings, so that proper bond may be had with the brick backing. The underside and backs of steps and platforms to be rough pointed where not exposed. The backs of sills, jambs, mullions, transoms, and lintels of door and window openings to be good bed-work, square, plumb, and true with the face.

Weathering and Drips. — All the sills, cornices, copings and projecting courses to be properly weathered, and to have a water-drip cut on underside to take the water from face of wall. The door and windowsills to have seats for jambs and mullions where shown by the details. The top course of stone under window-sills to be cut down 1″ clear through, square with the face, for cold-air inlet to heating coils; the stones under mullioned windows to have seats left for support of sills on line with mullions. Where no air-space is needed under sills their beds should only have bearings immediately below jambs and mullions.

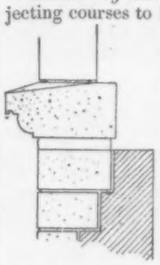


Fig.-7.

The cornices and coping-stones to be dished and graded for gutters (which will be lined with copper by the Government). Holes for down-pipes to be cut through all stone where required.

The joints for stone floors of porticos or balconies may be splayed or rabbetted, as per sketches, and close-jointed at the bottoms and grouted full and flush with Portland-cement mortar. The floors to be properly weathered.

The stonework of chimneys and vent-shafts to start at least 6″ below roof-lines; the cap-stones for vent-shafts to cover the full thickness of the wall and the cap-stones for chimneys to be one stone each and perforated for flues: each hole to be full size of flue.

Fig. 8. Fig 9

Chases to be cut into stonework of walls of building where area walls and cross walls return against it, to prevent the cracking of walls where joined, as the settlement of building will be greater than that of the area walls.

The stone slabs for dormer roofs to be in one piece for each slope, to extend 4″ at edges under the gable coping, main roof and ridge, and to be securely anchored and cramped.

Arches. — The joints of all voussoirs or arches to be rubbed to a true surface and to radiate from centres. The contractor to furnish the material, build and properly set all the wooden centres required for building the stone arches, which must not be struck or eased until the mortar is thoroughly set.

The balusters to have tenons 2″ square and ½″ long cut on bottoms and tops and properly let into mortises in base and capping of balustrade, and the latter to be let into the capping of pedestals not less than 2″.

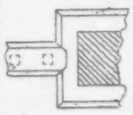


Fig.10.

Steps. — Where steps are built in between walls they should be housed into stone not less than 2″ and have a bearing on brick of 4″, and where joints occur in their lengths they must be well caulked flush with lead.

Finials. — The stone finials to have as broad bearing-beds as practicable, to have tenons let into mortises, and in addition, to have copper or lead dowels wedged and secured into stone as tightly as possible.

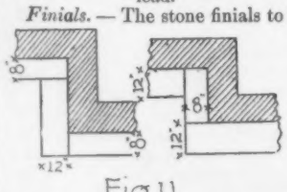


Fig.11.

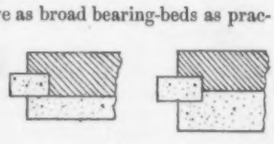


Fig.12.

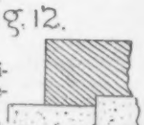


Fig.13.

At all reëntering angles the stones to be full width of the courses, and each alternate course to break joint as per Figure 11.

Where jamb stones are used at openings they should either extend back of the ashlar and check into each alternate

course, as per Figure 12, or the ashlar should extend into a rabbet in the jamb about 1″, as in Figure 13.

Corbels and Projecting Courses. — Corbels for supporting walls, etc., to be in one piece, and the end or ends built into the walls sufficiently for the weight above the ends to more than counterbalance the projecting weight. Projecting turrets to have long, wrought-iron rods anchoring them into main walls on each side every 6′ apart in height.

All projecting courses, sills, architraves, cornices, heads of openings, etc., to have a depth in wall not less than the greatest width of ashlar, and the depth in wall should never be less than its extreme projection beyond face of wall, in order that the stone may rest securely on the wall by its own weight.

Gable coping, where practicable, and not marring the design, should be stepped on underside so that level bearings may be had; where it is not stepped on underside then the entire coping on both sides of apex should be securely cramped together and fastened by copper or slate dowels to the wall on which it rests.

Where the down-spouts discharge the water on the surface, stones 2′ x 1′ 6″ x 6″ to be provided dished 2″ deep, and have channel cut to carry water away from building and set in place, the top about 1″ above sidewalk or gutter.

Approaches. — The work on approaches is always contracted for separately from the building, and is generally the last work done.

The stonework to be cut to the designs and dimensions, and placed in positions shown on the approach plan. The gate and fence posts to be in one piece, to be set in the ground about three or four feet on a bed of concrete or broken stone, and the earth rammed solidly around them.

The buffer or wheel-block at main entrance to be of granite, set in the ground against a wall, or built into the wall, and to have sufficient projection and height above ground to prevent the wagon-wheels from striking against platform or supporting wall; the upper outer edge of buffer to be rounded, and the exposed surface to be Number 6 cut-work.

The gate posts for their exposed angles to be provided with three-quarter round sugar-loaf granite fenders, and to have a granite stop

Fig. 14.

6″ or 8″ square placed midway between posts, with hole in centre for dropping rod of iron gate into and stops to hold each leaf of the gates open; the fenders and stops to be set 1′ 6″ or 2′ 0″ into ground and to be solidly rammed.

Fence Coping. — For supporting iron fences around the buildings and lots a brick or rubble wall with granite coping and usually a base of concrete will be built having sufficient depth to get below frost generally two or three feet below surface; the exposed coping to be Number 6 cut-work and 10″ or 12″ wide, weathered as shown by Figure 14. Instead of a wall and coping a solid stone 8″ to 12″ wide, about three feet deep, may be firmly bedded in the ground on a concrete base and securely rammed; a brick or concrete gutter to be laid against these copings for draining the lot.

Where the above copings are too expensive, stone blocks are used; these are to be 8″ or 10″ square at top, set about 2′ 6″ in the ground on a bed of broken stone, spaced about eight feet apart and solidly rammed; the iron fence posts to be let into the hole in centre of each block and leaded; in this case a thin blue stone or bricks set on end are used as curbing between sidewalk and grass.

Fig. 15.

Quarry Beds. — All stone to be cut to lie on its quarry or natural bed (where possible), except in case of columns, pilasters, voussoirs, mullions, jambs, panels, etc., which may be set on edge or vertically, as the case may require.

Patching. — No patching nor hiding of defects with composition of any kind will be allowed, and all defective stone or work will be rejected, and the contractor must make good such rejected work without unnecessary delay.

Lewis Holes. — No lewis holes to show on steps, platforms, copings, etc., or where they would be exposed to the weather.

Cramps and Anchors. — The stones to be properly cramped each to each, and to be anchored and cramped to brick backing wherever necessary and as directed by superintendent. The contractor to supply all dowels, anchors, pins, and metal cramps securing stones together as required and shown on detail or other drawings. The Government will supply all the galvanized-iron cramps and anchors for securing stone to brickwork, and will designate the positions, and the contractor to make the sinkings for, thoroughly embed in mortar and properly build-in all the cramps, anchors, etc. The exposed dowels for dormers, finials, and chimneys to be copper, and all cramps, anchors, etc., where possible, to be galvanized.

Each stone in courses of heavy projection, main cornices and copings to be anchored into brickwork by a rod ¾″ diameter, 3′ or 4′ long, with plate on end 12″ x 4″ x ¼″ built in brickwork and the upper end of rod passing through stone and secured by nut with washer.

The stones to be cramped each to each by cramps 12″ long by 1″ wide by $\frac{1}{16}$″ thick; let 1″ into each stone flush with the surface and grouted full with liquid mortar. The stones will also be secured to brickwork by cramps from 12″ to 16″ long by 1½″ wide by 1¼″ thick, let 1½″ into stone and turned up 4″ and extend into the brickwork one brick's length from back of stone above cramp, one to each stone where stones are large, and where stones are small, one to every two or three stones may be sufficient. The stones of random ashlar are not to be cramped together, but must be cramped or anchored to brick backing, about three cramps in every square yard of wall.

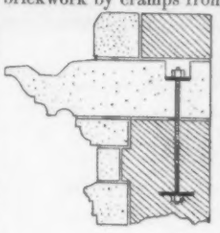


Fig. 16.

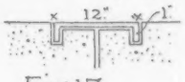


Fig. 17.

Mortar. — The mortar for all footings, rubble, and unexposed stonework to be best quality, composed of one (1) part cement equal to the United States Government brand, and two (2) parts clean, sharp sand, measure for measure, and a quantity of stone-lime paste equal to one-third (⅓) of the quantity of the cement, all thoroughly mixed immediately before use, and to be used, if possible, before the first set.

The mortar for all exposed stonework to be composed of the best quality of stone-lime (wood burned preferred), and clean, sharp sand mixed in the proportions of one-third (⅓) lime to two-thirds (⅔) sand, measure for measure. The lime to be slaked and left to sour as long as possible before using.

Setting. — All the stone to be bedded and jointed in lime-mortar, set with open joints; and plastered on the back with lime-mortar, or covered with a coat of a mixture composed of one-quarter rosin or asphalt to three-quarters coal-tar, applied while hot, to prevent the stain from the cement-mortar used for brick from discoloring the stone.

The horizontal courses of stonework to be kept perfectly level throughout, and the walls to be built up uniformly; that is, no portion must be carried higher than 4′ 6″ before the remainder is brought to the same level, unless especially ordered by the superintendent.

The stone must be set in proper consecutive order and no detention or delay will be allowed on account of brickwork, backing, etc.

Protection of Work. — All projections, mouldings, angles, sills, steps, copings, door and window jambs, buttresses, etc., to be substantially protected by boards, etc., from injury during construction. The work, as it progresses, must also be kept covered with boards when exposed to the weather, rain, etc., and, if considered necessary by the superintendent, must be thus covered whenever leaving off work. The contractor to furnish all lumber, nails, etc., and labor necessary for such protection, and to maintain same until the completion of the work.

Washing down and Pointing. — At completion the contractor will be required to wash down all the exterior stonework, to rake out the joints to a depth of ¾″ or 1″ and point the same flush with lime-putty and sand, colored to match the stone; the pointing to be finished as per Fig. 19, and leave the work clean.

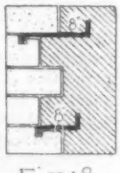


Fig. 18.

Thickness of Walls. — The stone facing of a wall is not considered in determining its thickness; it is the custom to make the brick backing sufficiently strong to carry the weight of superimposed loads, which is, generally speaking, the thickness as established by the building-law in New York City, and the stone facing may be considered as giving so much additional strength; but this does not appear to be excessive when it is known that it is the general practice to make 4″ air-spaces in all exterior brick walls, which, of course, would be weaker than solid walls without air-spaces.

Where basement walls are built of solid random rubble the walls should be not less than 8″ thicker than if built of brick, but where built of squared masonry, they are made the same thickness as brick walls.

Area walls, when short and having returns against walls of building, should be not less than 12″ thick; if they have stone facing, the backing, if brick, should be not less than 8″, and if stone, should be not less than 12″ thick; walls 20′ long and over should be treated as retaining-walls.

Retaining-Walls. — Retaining-walls are generally built of coursed ashlar with brick backing, or coursed masonry with squared rubble backing laid up in the best cement-mortar on a good concrete foundation, which must be carried beyond reach of frost. The earth, where coming against the wall, is always levelled off to the height of top of wall for a safe distance back of it.

Fig. 19.

The face of the wall to have a batter of 1″ or 1½″ to every foot in height, and the back to be stepped about 4″ every 2′ in length, and the wall to have a heavy stone coping not less than 12″ thick the full width of the wall, with a projection of 1″ or 1½″ beyond the face: the stones to be in long lengths.

The stone masonry wall with rubble backing to have a thickness equal to $\frac{35}{100}$ of its height from concrete foundation to top of coping; this thickness to be taken at one-third (⅓) of the height, and the batter on face and stepping on back to be determined from this point. At back of wall there will be a gutter laid on a concrete base and the space from outer edge

of gutter down to level of ground-line on front, to be filled with broken stone; the opening through wall for passage of gutter drain-pipes to be sufficiently large to allow any water which may accumulate below the surface to escape; these openings should not be over twenty feet apart; below this broken stone to top of concrete foundation to be filled-in solidly with concrete.

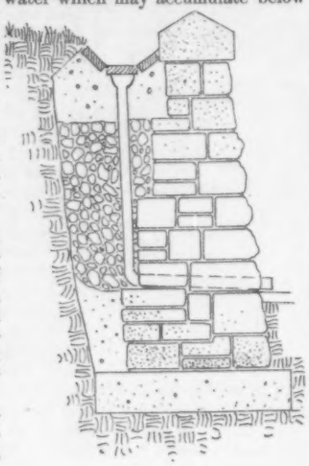


Fig 20.

The beds are all horizontal and the joints vertical; the beds are seldom made normal to batter, as recommended by many engineers.

The coursed-ashlar wall with brick backing to have a thickness equal to $\frac{4}{10}$ of the height of wall, and to have a gutter and filled-in with broken stone and concrete, as described for stone-masonry-wall. The back of brick to have a coating of asphalt or tar.

Sizes of Piers and Columns.— All detached stone piers, columns, etc., should have a weight on them not exceeding one-eighth ($\frac{1}{8}$) of the crushing strength per square foot, and the height should be not over ten or twelve times the smallest diameter or side. The crushing strengths of the principal building stones in use can be found in most any engineer's or architect's pocket-book, and need not be mentioned here.

PRESERVING OR WATERPROOFING STONE.

It is sometimes necessary to use some process to preserve stone from disintegrating under the action of the weather, but it is the best plan, to select stone of such character as to be practically imperishable and need no artificial assistance for preservation, and it has been the object of the Government to use only such stone. In very few instances has it been found necessary to use a preservative.

The process for preserving stone given by Mr. Powell in his work on "*Foundations and Foundation Walls*" and those mentioned in the *American Architect* of March 19, 1887 have not been tried by the Government.

The materials for preserving stone should be colorless, easily absorbed by and thoroughly incorporated with the stone, and should be imperishable and irremovable.

The only process used by the Government for many years is what is known as "Wheaton's Process." It is manufactured and applied to walls by The National Brick and Stone Preserving Co., of Washington, D. C.: there is no patent on the mixture they use, but the ingredients are known only to the manufacturers. It has not been in use a year yet, and of course experience and a test of years can only prove what is claimed for it, which is that it is absolutely imperishable and needs no renewing. It is a dark liquid without any vegetable elements in it and should be applied to stone or brick with a brush at a temperature not colder than fifty degrees, but the warmer the better, and should have two coats applied, with a short time intervening between the applications.

A piece of Seneca brownstone was treated by this process. Water dropped on it remained in a globular state and not a particle was absorbed: after holding the stone in water and then breaking it, the water appeared not to have penetrated in the slightest: while water dropped on the untreated stone was absorbed almost as readily as if dropped on raw cotton. It makes the stone a scarcely perceptible shade darker, but leaves the color perfectly uniform and not the slightest appearance to indicate that the stone has been treated, except by comparison with an untreated stone.

MEASUREMENTS, CUTTING, ETC.

Rubble-work is sometimes estimated by the cubic yard, or perch ($24\frac{3}{4}$ cubic feet) but generally by the cubic foot: all other stonework, ashlar, dimension and cut stone, is estimated by the cubic foot.

In measuring rubble, solid masonry walls, and random ashlar, the length multiplied by the average thickness by the height of the wall is to be taken to obtain the cubic feet; no allowance to be made in the measurement for wastage, but in the price. Where a uniform projection of rock-facing is required it is to be added to the thickness of the stone to obtain the cubic feet: the object being to obtain the actual number of cubic feet contained in the completed wall, taking the extreme dimensions for all stones.

All coursed, dimension and cut stonework should be measured course by course, or piece by piece. Dimension stone should be considered as each piece measured and the cubic feet obtained separately: of course where a number of stones have two dimensions the same and their lengths different, it saves much time and is just as correct to add all the lengths together and multiply by the width and height.

In making schedules of stone each course and different class of work should be kept separate and classified under its proper course or architectural name of its position in the building: each stone should have its dimensions (first the length, then the width or depth in wall and last the height) set down separately; of course where there are a number of stones of exactly the same size and similar, the number of stones with size of each need only be given.

The simplest rule for scheduling the dimensions of irregularly shaped stones and, of course, this applies where acurate detail measurements are desired, is, to take the dimensions of the smallest rectangular prism out of which a stone can be cut. The actual net dimensions figured on the drawings to be taken: as before stated no allowance for wastage in quarrying is now made.

Generally the entire quantity of stone in a contract is measured and an average price put upon the whole; sometimes each course or different class of work is measured and priced separately: a simpler plan which is almost as accurate is to measure and price out the work separately in the following classes, namely: random-rubble, squared masonry, coursed masonry, random ashlar, rock-face coursed ashlar, piers, bearing-stones, plain dressed ashlar, moulded-work, and carved-work; of course for very ornamental and elaborate carving each piece should be considered separately.

Cutting.— After the stone has been divided in the above mentioned classes, a few stones in each class may be estimated and the price so obtained, taken as the price per cubic foot for that class of work, which must include furnishing the rough stock, dressing it to the dimensions and designs shown on the drawings and setting it in the building complete.

To estimate the cost of a cubic foot of stone the proper plan to pursue is: take one stone, a fair average in size for the rest, obtain the number of cubic feet, multiply by the cost of the rough stock, which must include delivering the stone on the site and setting; measure the superficial feet of bed, build and joints (the bed is the bottom on which it rests, the build is the top on which another stone rests, the joints are the surfaces which come in contact with other stones; where the backs are pitched off no account is taken of it, but where they are pointed the square feet of backs are added to bed and joint work) and the whole multiplied by the cost of cutting bed-work; measure the superficial feet of plain face-work and multiply by the proper price for this work and in same manner estimate the moulded and carved work: adding together the entire cost of rough stock and of cutting all surfaces of the stone, and dividing by the number of cubic feet in the stone will give the cost per cubic foot.

Bed and joint work should be measured the extreme length by the extreme width of the stone, all other cutting, face-work, moulding, carving, etc., should be taken only by the actual net measure. The lengths of all mouldings should be taken to the extreme angles both external and re-entering and it is customary to allow from 6″ to 1 foot additional in length to pay for forming each mitre.

All surfaces which are sunk below a projection and which are bevelled, that is, not at right angles, are considered sunk surfaces, and should be measured and estimated separately.

The cost of cutting varies according to the hardness, etc., of the stone, and is governed by the prices of the stone-cutters' unions in various localities. The unions in most cities from time to time adopt prices and rules of measurement for cutting stone, which differ greatly and are very confusing: in many instances they double, and sometimes treble, the measurement, so as to keep the same price. This should never be done: a standard system should be adopted, to properly classify each different kind of labor in cutting, to measure the actual net-surface cut, and to make the proper allowance in price for the cost of cutting each different kind; and this is the plan which has been uniformly followed by the Govern[illegible]

Granite-cutters do not cut soft stone [illegible] cutters of soft stone, marble, limestone, sandstone and freestone do not cut granite; their organizations, wages and methods of cutting being different.

Cost of Cutting. — Sunk-bed and joint-work costs from $1\frac{1}{4}$ to $1\frac{3}{4}$ times plain bed-work, and circular-bed and joint-work from $1\frac{1}{2}$ to 2 times plain bed-work.

Plain-face costs from 2 to 3 times bed-work.
Sunk " " $1\frac{1}{2}$ to $1\frac{1}{2}$ " plain-face.
Circular-face " $1\frac{1}{2}$ to 2 " "
Moulded-work costs from $2\frac{1}{2}$ to 5 times plain-face.
Circular moulded-work costs about 2 times plain moulding.

AVERAGE COSTS OF CUTTING PER SQUARE FOOT.

Kind of Work.	Granite.	Marble.	Lime and Sandstones.
Beds and joints	$ .30 to .35	$ .20 to .25	$ .12 to .15
Pean-hammered	.45 to .50	.30 to .35	.15 to .20
Plain-face	No. 6 cut, .65	.40 Rubbed and drove.	.20 to .25
"	" 8 " .75		
"	" 10 " .88		
"	" 12 " 1.10	.50 Tooled	.25 to .30

Polishing granite costs from $1.50 to $2.00 per square foot, in addition to cost of plain face-work. No definite cost can be given for carved-work, as it depends entirely upon the design. It has cost in granite from $5.00 up as high as $30.00 per square foot, and in soft stones, from $3.00 to $15.00

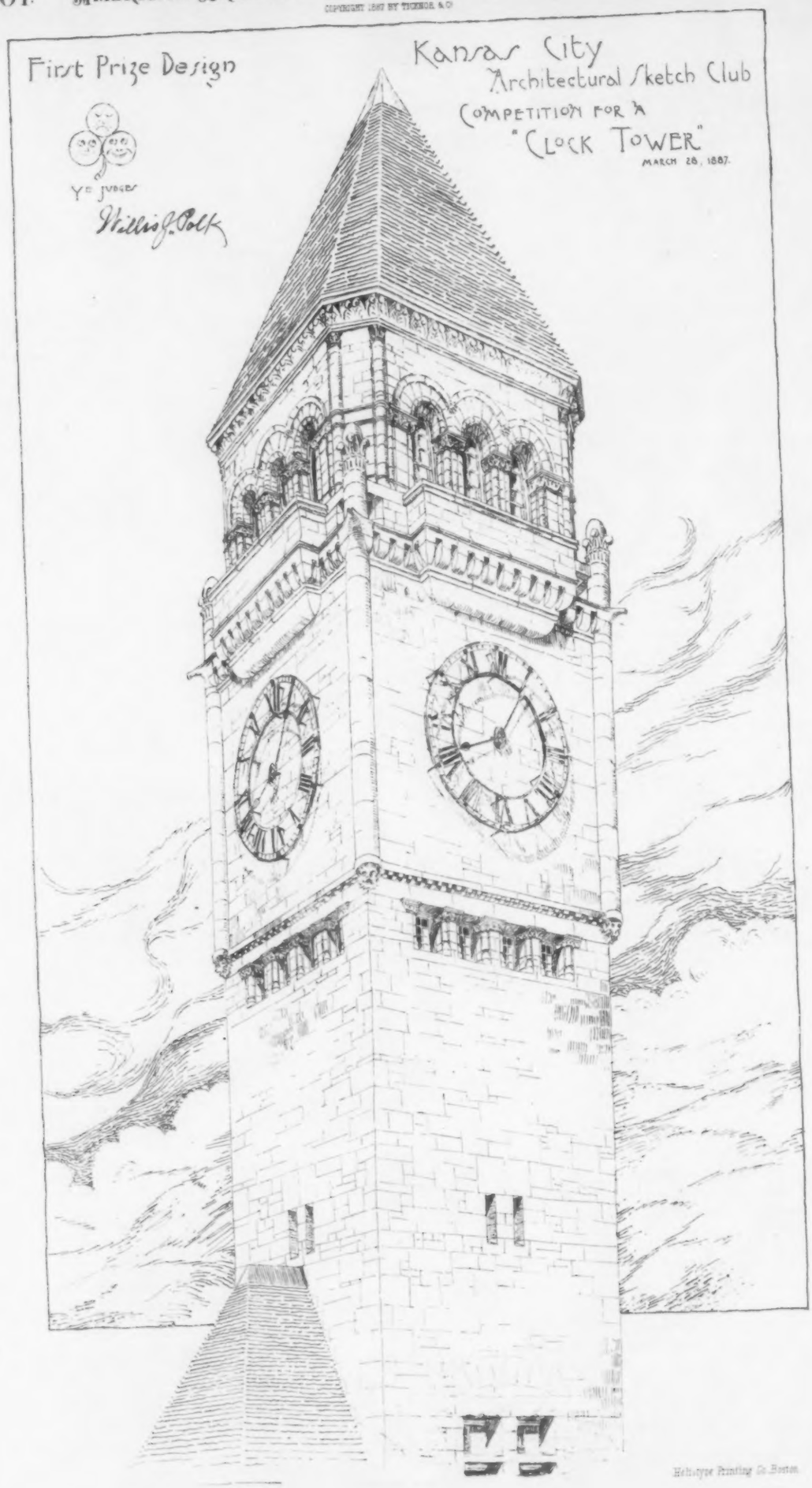
Cost per cubic foot. — The cost per cubic foot of stonework depends upon the cost of quarrying or furnishing the rough stock, delivering the stone at the site of the building, stone-cutters' wages per day and setting the stone in place in the building.

COPYRIGHT 1887 BY TICKNOR & CO

First Prize Design

Kansas City
Architectural Sketch Club
Competition for a
"Clock Tower"
March 28, 1887.

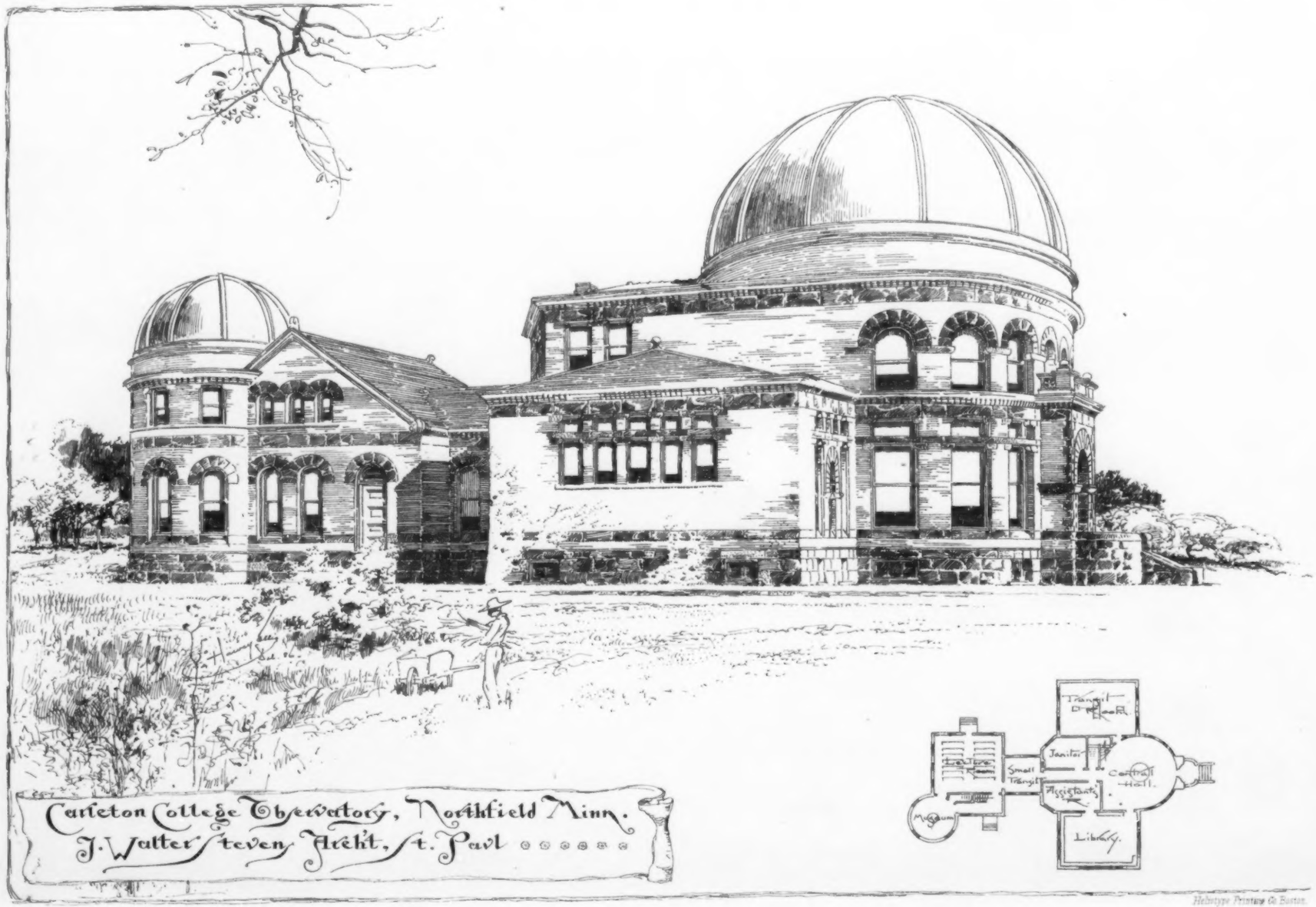
Yrs Judges
Willis J. Polk



Heliotype Printing Co. Boston.

American Architect and Building News, July 2 1887. No. 601.

COPYRIGHT 1887 BY ROBERTSON & CO.

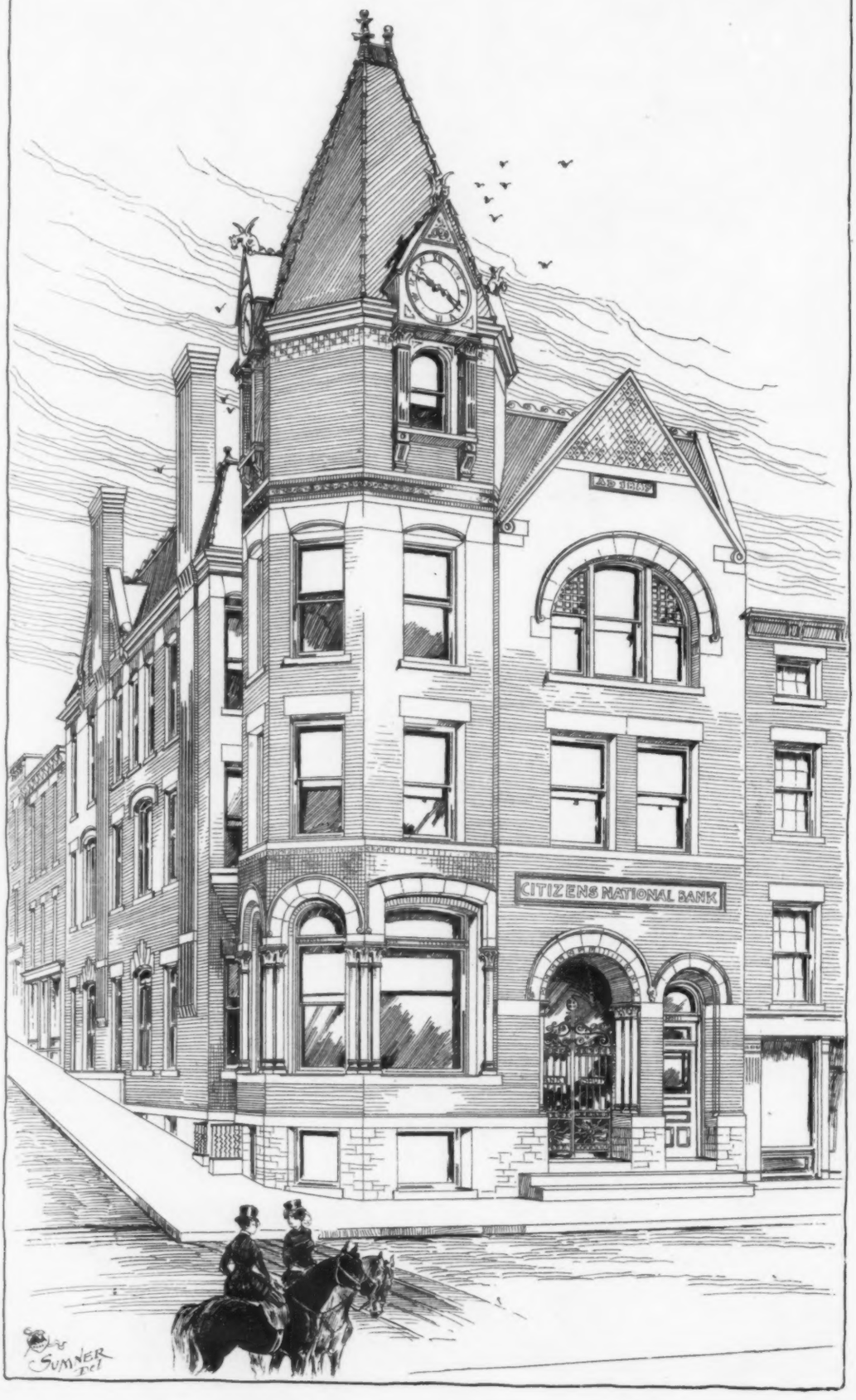


Carleton College Observatory, Northfield Minn.
J. Walter Steven Archt, St. Paul

Heliotype Printing Co Boston.

COPYRIGHT 1887 BY TICKNOR & CO

·CITIZENS·NATIONAL·BANK·
·TOWANDA·PA·
MESSRS. PIERCE·&·DOCKSTADER·ARCHTS
ELMIRA·N.Y.



COPYRIGHT 1887 BY TICKNOR & CO

SKETCH A.

WEST NEWTON ST. ELEVATION.

"HOME FOR LITTLE WANDERERS".

Koster & Wallis Archts.

Heliotype Printing Co. Boston

COPYRIGHT 1887 BY TICKNOR & Co

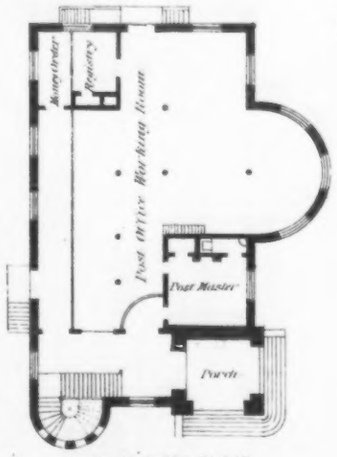
HOUSE FOR Mr FRANK HASBROUCK MARKET STREET POUGHKEEPSIE N.Y. E.C.WITHERS. ARCHT. N.Y. 1887

Heliotype Printing Co. Boston.

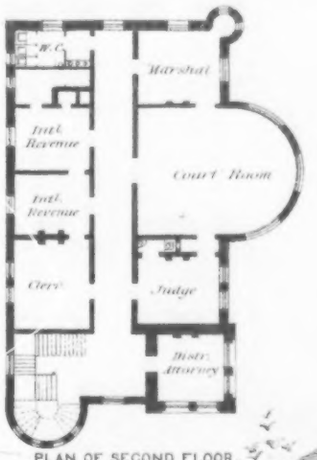
American Architect and Building News, July 2 1887. No. 601

Copyright 1887 by Ticknor & Co.

U.S. Ct. Ho. P.O. &c.
Montpelier, Vt.



PLAN OF FIRST FLOOR



PLAN OF SECOND FLOOR

M.E. BELL
Supervising Architect

Heliotype Printing Co. Boston.

ACTUAL COST OF STONE FURNISHED, CUT AND SET, PER CUBIC FOOT.
(In some instances bids are given when so stated.)

Kind of Work.	Place.	Date.	Cost.
Random rubble, limestone	Harrisburg, Va.	1885	$ .20
" "	Cincinnati, O.	1884	.20
" "	Denver, Col.	1883	.20
" sandstone	Pittsburgh, Pa.	1886	.35
Squared masonry, sandstone	"	1885	.60
Coursed " "	"	"	.70
Squared " limestone	Columbus, O.	1884	.68
" " granite	Memphis, Tenn.	1886	.30
Rock-face ashlar "	Pittsburgh, Pa.	1886	1.38
" " and cut stone granite, avg	"	"	1.60
Cut-granite basement and area walls	"	"	2.00
Rock-face ashlar and cut and moulded trimmings, Stony Point, Mich., sandstone	Ft. Wayne, Ind.	1885	1.52
Trimmings, Bedford limestone. *Bid*	"	"	1.65
Rock-face ashlar, granite, retaining wall	Memphis, Tenn.	1886	1.00
Dressed coping " "	"	"	2.50
White sandstone. Furnish only	Dallas, Tex.	1885	.35
Armijo " "	Denver, Col.	"	.73
Cut and moulded sandstone of superstructure	Council Bluffs, Ia.	"	1.91
" " " average bid	" "	"	2.12
" " limestone, lowest "	" "	"	1.87
" " " average "	" "	"	2.33
Rock-face aslar, cut and moulded trimmings, Middlesex brownstone	Rochester, N. Y.	1884	2.41
Cut and moulded Bedford limestone	Louisville, Ky.	1885	2.00
" " sandstone	Dallas, Tex.	"	2.46
" " limestone	Hannibal, Mo.	"	1.83
" " sandstone	Des Moines, Ia.	1887	2.27
" " granite, superstructure	Pittsburgh, Pa.	1886	3.00

The average cost to furnish and cut only, the granite for the superstructure of the Baltimore Post-office, etc., in 1884, was $2.54 for cut, ashlar, moulded and carved trimmings, or average for plain ashlar, $1.40; for moulded-work, $3.00, and for carved-work, $6.50 per cubic foot.

The best general idea of the cost of furnishing rough stone, and the cost to furnish, cut and set the stone, may be obtained by giving the lowest and the average of the thirty-five bids received for the stonework of the Brooklyn Post-office, opened in 1885. The basement and first story were built of rock-face, coursed ashlar, the second story and all the trimmings, of dressed-work, with a good deal of moulded and carved work.

KIND OF STONE.	Rough Stone per cubic foot.	Furnish cut and set per cubic foot.
Granite, accepted bid	$ .58	$2.02
Granite, average bid	.70	2.71
Marble lowest bid	1.50	2.92
Marble, average bid	1.66	3.06
Bedford limestone, lowest bid	.90	1.92
Bedford limestone, average bid	.85	2.07
Amherst and Berea S'dtones, lowest bid	.90	2.00
Amherst and Berea S'dtones, average "	.90	2.20
Brown-stone, lowest bid	1.19	2.10
Brown-stone, average bid	1.15	2.31

JAS. E. BLACKWELL.

[To be continued.]

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF ROBERT GOELET, ESQ., NEWPORT, R I. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

A CLOCK-TOWER, DESIGNED BY MR. W. J. POLK, KANSAS CITY, MO.

THIS design was placed first in a competition, recently held by the Kansas City Architectural Sketch Club, in conformity with the subjoined recommendations:

A GOOD design well rendered in a free, clear, pen-and-ink drawing. The general distribution of parts very pleasing and effective; the transition from the square clock-stage to the lantern, with the canted corners, is skilfully managed, and the author exhibits the rare virtue of knowing where to hold his hand, as there are large and effective areas of repose enhancing the value of the richer parts; the triple arcade is well rendered and keeps safely and prudently within the limits of conventional style; the solid balcony is a very valuable adjunct to the design, and is well composed; the cornice of the lantern is good, and the roof-slope finishes the composition very effectively. The little corbelled string-course, under the clock-stage, would have been insufficient without the low range of square windows underneath, the mullions of which are very properly strong and vigorous.

HENRY VAN BRUNT,
FRED'K B. HAMILTON, } *Jury.*
ADRIANCE VAN BRUNT.

ASTRONOMICAL OBSERVATORY, "CARLETON COLLEGE," NORTHFIELD, MINN. MR. J. W. STEVENS, ARCHITECT, ST. PAUL, MINN.

THE structure is now nearly completed and will cost $29,000. The observatory will be equipped with one nine-inch equatorial, one sixteen-inch equatorial, also, one large and one small transit.

CITIZENS' NATIONAL BANK, TOWANDA, PA. MESSRS. PIERCE & DOCKSTADER, ARCHITECTS, ELMIRA, N. Y.

THE building is of pressed-brick and brownstone, with diamond tile roof, copper cornice. The bank is to be finished in cherry, the other rooms in native woods. Dimensions, 30′ x 83′. It will cost, complete, about $18,000.

UNITED STATES POST-OFFICE AND COURT-HOUSE, MONTPELIER, VT. MR. M. E. BELL, SUPERVISING ARCHITECT.

HOUSE AT HAVERHILL, MASS. MESSRS. WHEELER & NORTHEND, ARCHITECTS, LYNN, MASS.

COMPETITIVE DESIGN FOR HOUSE FOR LITTLE WANDERERS, BOSTON, MASS. MESSRS. KEISTER & WALLIS, ARCHITECTS, NEW YORK, N. Y.

HOUSE OF FRANK HASBROUCK, ESQ., POUGHKEEPSIE, N. Y. MR. F. C. WITHERS, ARCHITECT, NEW YORK, N. Y.

SAFE BUILDING.—XVII.[1]

IT is generally best to build the flue of a chimney plumb from top to bottom, and, of course, of same area throughout. Sometimes the flue is gradually enlarged towards the top for some five to ten feet in height, which is not objectionable, and the writer has obtained good results thereby; some writers, though, claim the flue should be diminished at the top, which, however, the writer has never cared to try. Galvanized iron bands should be placed around the chimney at intervals, particularly around the top part, which is exposed very much to the disintegrating effects of the weather and the acids contained in the smoke. No smoke flue should ever be pargetted (plastered) inside, as the acids in the smoke will eat up the lime, crack the plaster, and cause it to fall. The crevices will fill with soot and be liable to catch fire. The mortar-joints of flues should be of cement, or, better yet, of fire-clay, and should be carefully struck, to avoid being eaten out by the acids.

Tops of Chimney Flues.

Calculation of Walls.—Bulging. Where walls are long, without buttresses or cross-walls, such as gable-walls, side-walls of building, etc., we can take a slice of the wall, one running foot in length, and consider it as forced to yield (bulge) inwardly or outwardly, so that for ρ^2 we should use:

$$\rho^2 = \frac{d^2}{12};$$ where d the thickness of wall in inches. The area or a would then be, in square inches, $a = 12.d$.

Inserting these values in formula (59) we have for

BRICK OR STONE WALLS.

$$w = \frac{d.\left(\frac{c}{f}\right)}{0{,}0833 + 0{,}475.\frac{L^2}{d^2}} \qquad (62)$$

Where w = the safe load, in lbs., on each running foot of wall (d'' thick).

Where d = the thickness, in inches, of the wall at any point of its height.

Where L = the height, in feet, from said point to top of wall.

Where $\left(\frac{c}{f}\right)$ = the *safe* resistance to crushing, in lbs., per square inch, as given in Table V.

If it is preferred to use tons and feet, we insert in formula (60): for A = D, where D the thickness of wall, in feet, and we have:

$$P^2 = \frac{D^2}{12};$$ therefore

$$W = \frac{D.\left(\frac{c}{f}\right)}{14 + 0{,}552.\frac{L^2}{D^2}} \qquad (63)$$

[1] Continued from page 275, No. 597.

Where W = the *safe* load, in tons, of 2000 lbs., on each running foot of wall (D feet thick).

Where D = the thickness of wall, in feet, at any point of its height.

Where L = the height, in feet, from said point to the top of wall.

Where $\left(\frac{c}{f}\right)$ = the safe resistance to crushing of the material, in lbs., per square inch, as found in Table V.

Anchored Walls. Where a wall is thoroughly anchored to each tier of floor beams, so that it cannot possibly bulge, except between floor-beams, use the height of story (that is, height between anchored beams in feet) in place of L and calculate d or D for the bottom of wall at each story.

The load on a wall consists of the wall itself, from the point at which the thickness is being calculated to the top, plus the weight of one foot in width by half the span of all the floors, roofs, partitions, etc. Where there are openings in a wall, add to pier the proportionate weight which would come over opening; that is, if we find the load per running foot on a wall to be 20000 lbs., and the wall consists of four-foot piers and three-foot openings alternating, the piers will, of course, carry not only 20000 lbs. per running foot, but the 60000 lbs. coming over each opening additional, and as there are four feet of pier we must add to each foot $\frac{60000}{4} = 15000$ lbs.; we

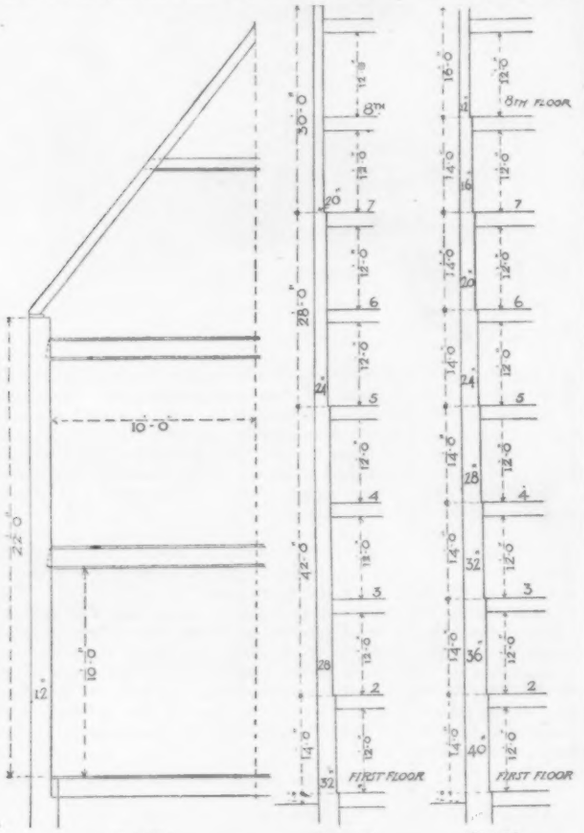


Fig. 88. Fig. 89. Fig. 90.

therefore calculate the pier part of wall to carry 35000 lbs. per running foot. The actual load on the wall must not exceed the safe load as found by the formula (62) or (63).

Example.

Wall of Country House. *A two-story-and-attic dwelling has brick walls 12 inches thick; the walls carry two tiers of beams of 20 feet span; is the wall strong enough? The brickwork is good and laid in cement mortar.*

We will calculate the thickness required at first story beam level, Figure 88.

The load is, per running foot of wall:

Wall	= 22.112 =	2464 lbs.
Wind	= 22. 15 =	330 lbs.
Second floor	= 10. 90 =	900 lbs.
Attic floor	= 10. 70 =	700 lbs.
Slate roof (incl. wind and snow)	= 10. 50 =	500 lbs.
Total load	=	4894 lbs.

For the quality of brick described we should take from Table V:

$$\left(\frac{c}{f}\right) = 200 \text{ lbs.}$$

The height between floors is 10 feet, or

$$L = 10,$$

therefore, using formula (62) we have:

$$w = \frac{d.\left(\frac{c}{f}\right)}{0{,}0833 + 0{,}475.\frac{L^2}{d^2}} = \frac{12.200}{0{,}0833 + 0{,}475.\frac{10.10}{12.12}} = 5807 \text{ lbs.}$$

So that the wall is amply strong. If the wall were pierced to the extent of one-quarter with openings, the weight per running foot would be increased to 6525 lbs. Over 700 lbs. more than the safe load, still the wall, even then, would be safe enough, as we have allowed some 330 lbs. for wind, which would rarely, if ever, be so strong; and further, some 1200 lbs. for loads on floors, also a very ample allowance; and even if the two ever did exist together it would only run the compression $\left(\frac{c}{f}\right)$ up to 225 lbs. per inch, and for a *temporary* stress this can be safely allowed.

The writer would state here, that the only fault he finds with formulæ (59), (60), (62) and (63), is that their results are apt to give an excess of strength; still it is better to be in fault on the safe side and be sure.

Example.

Walls of City Warehouse. *The brick walls of a warehouse are 115 feet high, the 8 stories are each 14 feet high from floor to floor, or 12 feet in the clear. The load on floors per square foot, including the fire-proof construction, will average 300 lbs. What size should the walls be? The span of beams is 26 feet on an average.*

According to the New York Building Law, the required thicknesses would be: first story, 32″; second, third, and fourth stories, 28″; fifth and sixth stories, 24″; seventh and eighth stories, 20″.

At the seventh story level we have a load, as follows, for each running foot of wall:

Wall	= 30.1⅔.112 =	5600
Wind	= 30.30 =	900
Roof	= 13.120 =	1560
Eighth floor	= 13.300 =	3900
Total	=	11960 lbs., or 6 tons.

The safe load on a 20″ wall 12 feet high, from formula (63) is:

$$W = \frac{1\frac{2}{3}.200}{14 + 0{,}552.\frac{12.12}{1\frac{2}{3}.1\frac{2}{3}}} = \frac{333}{14 + 0{,}552.51{,}84} = 7{,}811 \text{ tons, or}$$

15622 lbs.

If one-quarter of the wall were used up for openings, slots, flues, etc., the load on the balance would be 8 tons per running foot, which is still safe, according to our formula.

At the fifth-story level the load would be:

Load above seventh floor	=	11960
Wall	= 28.2.112 =	6272
Wind	= 28.30 =	840
Sixth and seventh floors	= 2.13.300 =	7800
Total	=	26872 lbs. or 13½

tons.

The safe load on a 24″ wall, 12 feet high, from formula (63) is:

$$W = \frac{2.200}{14 + 0{,}552.\frac{12.12}{2.2}} = \frac{400}{14 + 0{,}552.36} = 11{,}809 \text{ tons,}$$

or 23618 lbs.

Glossary of Symbols.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.:—

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{d}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{II}, a_{III}, etc., or b, b_{II}, b_{III}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance:—

m = moment or bending moment at *centre*.
m_A = " " " *point A*.
m_B = " " " *point B*.
m_X = " " " *point X*.
s = strain at *centre*.
s_B = " *point B*.
s_X = " *point X*.
v = stress at *centre*.
v_D = " *point D*.
v_X = " *point X*.
w = load at *centre*.
w_A = " *point A*.

This is about 10 per cent less than the load, and can be passed as safe, but if there were many flues, openings, etc., in wall, it should be thickened.

At the second-story level the load would be:

Load above fifth floor		= 26872
Wall	= 42. 2⅔.112	= 10976
Wind	= 42. 30	= 1260
Third, fourth and fifth floors	= 3.13.300	= 11700
Total		= 50808, or

25 tons.

The safe-load on a 28″ wall, 12 feet high, from formula (63) is:

$$W = \frac{2\frac{2}{3}.200}{14 + 0{,}552.\frac{12.12}{2\frac{2}{3}.2\frac{2}{3}}} = \frac{467}{14 + 0{,}552.26{,}45} = 16{,}33 \text{ tons},$$

or 32660 lbs.

Or, the wall would be dangerously weak at the second-floor level.

At the first-floor level the load would be:

Load above second floor		= 50808
Wall	= 14. 2⅔.112	= 4181
Wind	= 14.30	= 420
Second floor	= 13.300	= 3900
Total		= 59309, or 29⅔ tons.

The safe-load on a 32″ wall, 12 feet high, from formula (63) is:

$$W = \frac{2\frac{2}{3}.200}{14 + 0{,}552.\frac{12.12}{2\frac{2}{3}.2\frac{2}{3}}} = \frac{533}{14 + 0{,}552.20{,}25} = 21{,}169 \text{ tons},$$

or 42338 lbs.

The wall would, therefore, be weak at this point, too.

Now while the conditions we have assumed, an eight-story warehouse with all floors heavily loaded, would be very unusual, it answers to show how impossible it is to cover every case by a law, not based on the conditions of load, etc. In reality the arrangements of walls, as required by the law, are foolish. Unnecessary weight is piled on top of the wall by making the top 20″ thick, which wall has nothing to do but to carry the roof. (If the span of beams were increased to 31 feet or more the law compels this top wall to be 24″ thick, if 41 feet, it would have to be 28″ thick, an evident waste of material.) It would be much better to make the top walls lighter, and add to the bottom; in this case, the writer would suggest that the eighth story be 12″; the seventh story 16″; the sixth story, 20″; the fifth story, 24″: the fourth story, 28″; the third story, 32″; the second story, 36″, and the first story 40″, see Figure 90.

This would represent *but* 4⅔ cubic feet of additional brickwork for every running foot of wall; or, if we make the first-story wall 36″ too, as hereafter suggested, the amount of material would be exactly the same as required by the law, and yet the wall would be much better proportioned and stronger as a whole. For we should find (for L = 12 feet),

Actual load at eighth-floor level,	3832
Safe load on a 12″ wall from Formula (62)	4298
Actual load at seventh-floor level,	10243
Safe load on a 16″ wall from Formula (62)	9135
Actual load at sixth-floor level,	17176
Safe load on a 20″ wall from Formula (62)	15729
Actual load at fifth-floor level,	24632
Safe load on a 24″ wall from Formula (62)	23750
Actual load at fourth-floor level,	32611
Safe load on a 28″ wall from Formula (62)	32825
Actual load at third-floor level,	41112
Safe load on a 32″ wall from Formula (62)	42638
Actual load at second-floor level,	50136
Safe load on a 36″ wall from Formula (62)	52902
Actual load at first-floor level,	59683
Safe load on a 40″ wall from Formula (62)	63492

The first-story wall could safely be made 36″ if the brickwork is good, and there are not many flues, etc., in walls, for then we could use $\left(\frac{c}{f}\right) = 250$, which would give a safe load on a 36″ wall = 65127 lbs., or more than enough.

The above table shows how very closely the Formula (62) would agree with a practical and common-sense arrangement of exactly the same amount of material, as required by the law.

Thrust of barrels. Now, if the upper floor were laden with barrels, there might be some danger of these thrusting out the wall. We will suppose an extreme case, four layers of flour barrels packed against the wall, leaving a 5-foot aisle in the centre. We should have 20 barrels in each row (Fig. 91), weighing in all 20.196 = 3920 lbs. These could not well be placed closer than 3 feet from end to end, or, say, 1307 lbs., per running foot of wall; of this amount only one-half will thrust against wall, or, say, 650 pounds.

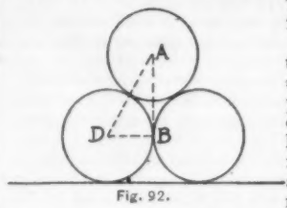


Fig. 92.

The radius of the barrel is about 20″.

If Figure 92 represents three of the barrels, and we make A B = $w_1 = \frac{1}{2}$ the load of the flour barrels, per running foot of walls, it is evident that D B will represent the horizontal thrust on wall, per running foot. As D B is the radius, and as we know that A D = 2 D B or = 2 radii, we can easily find A B, for:

$$A\,D^2 - D\,B^2 = A\,B^2 \text{ or } 4.\ D\,B^2 - D\,B^2 = w_1{}^2 \text{ or}$$

$$D\,B^2 = \frac{w_1{}^2}{3} \text{ or } D\,B = \frac{w_1}{\sqrt{3}} = \frac{w_1}{1{,}73} = 0{,}578.w_1$$

Or, $h = 0{,}578.\ w_1$ (64)

Where h = the horizontal thrust, in lbs., against each running foot of wall, w_1 = one-half the total load, in lbs., of barrels coming on one foot of floor in width, and half the span.

In our case we should have:

$h = 0{,}578.650 = 375$ lbs.

Now, to find the height at which this thrust would be applied, we see, from Figure 91, that at point 1 the thrust would be from one line of barrels; at point 2, from two lines; at point 3, from three lines, etc.; therefore, the average thrust will be at the centre of gravity of the triangle A B C, this we know would be at one-third the height A B from its base A C.

Now B C is equal to 6r or six radii of the barrels; further

A C = 3r, therefore:

A $B^2 = 36.r^2 - 9r^2 = 25.r^2$, and

A B = 5r; therefore $\frac{AB}{3} = 1\frac{2}{3}r$.

To this must be added the radius A D (below A) so that the central point of thrust, O in this case, would be above the beam a distance $y = 2\frac{2}{3}.r$.

Where y = the height, in inches, above floor at which the average thrust takes place.

Where r = radius of barrels in inches.

Our radius is 10″, therefore:

$y = 26\frac{2}{3}$″

Now, in Figure 93 let A B C D be the 12″ wall, A the floor level, G M the central axis of wall, and A O = 26⅔; draw O G horizontally; make G H at any scale equal to the permanent load on A D, which, in this case, would be the former load less the wind and snow allowances on wall and roof, or

3832 − (16.30 + 13.30) = 2962, or, say 3000 lbs.

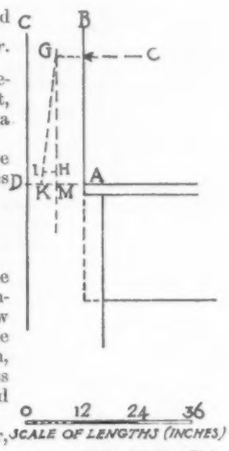


Fig. 93.

Therefore, make G H = 3000 lbs., at any scale; draw H I = h = 375 lbs., at same scale, and draw and prolong G I till it intersects D A at K.

The pressure at K will be

p = G I = 3023.

We find the distance M K measures

M K = $x = 3\frac{1}{3}$″.

Therefore, from formula (44) the stress at D will be:

$$v = \frac{3023}{144} + 6.\frac{3\frac{1}{3}.3023}{12.144} = +\,56 \text{ lbs. (or compression)}.$$

While at A the stress would be, from formula (45):

$$v = \frac{3023}{144} - 6.\frac{3\frac{1}{3}.3023}{12.144} = -\,14 \text{ lbs. (or tension)}, \text{ so that}$$

the wall would be safe.

The writer has given this example so fully because, in a recent case, where an old building fell in New York, it was claimed that the walls had been thrust outwardly by flour barrels piled against them.

Narrow Piers. Where piers between openings are narrower than they are thick, calculate them, as for isolated piers, using for d (in place of thickness of wall) the width of pier between openings; and in place of L the height of opening. The load on the pier will consist, besides its own weight, of all walls, girders, floors, etc., coming on the wall above, from centre to centre of openings.

Wind-pressure. To calculate wind-pressure, assume it to be normal to the wall, then if A B C D, Figure 94, be the section of the whole wall above ground (there being no beams or braces against wall).

Make O D = ½. A D = $\frac{L}{2}$; draw G H, the vertical neutral axis of the whole mass of wall, make G H, at any convenient scale, equal to the whole weight of wall; draw H I horizontally equal to the total amount of wind-pressure.

This wind-pressure on vertical surfaces is usually assumed as being equal to 30 lbs. per square foot of the surface, provided the surface is flat and normal, that is, at right

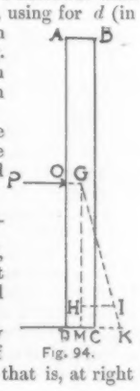


Fig. 94.

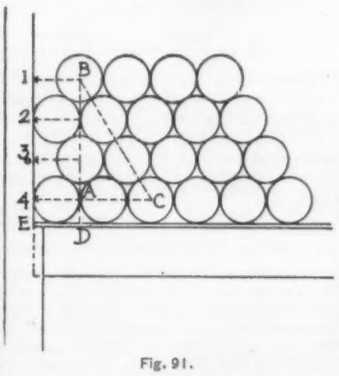


Fig. 91.

angles to the wind. If the wind strikes the surface at an angle of 45° the pressure can be assumed at 15 lbs. per foot.

It will readily be seen, therefore, that the greatest danger from wind, to rectangular, or square towers, or chimneys, is when the wind strikes at right angles to the widest side, and not at right angles to the diagonal. In the latter case the exposed surface is larger, but the pressure is much smaller, and then, too, the resistance of such a structure diagonally is much greater than directly across its smaller side.

In circular structures multiply the average outside diameter by the height, to obtain the area, and assume the pressure at 15 lbs. per square foot. In the examples already given we have used 15 lbs., where the building was low, or where the allowance was made on all sides at once. Where the wall was high and supposed to be normal to wind we used 30 lbs. Referring again to Figure 94, continue by drawing G I, and prolonging it till it intersects D C, or its prolongation at K. Use formulæ (44) and (45) to calculate the actual pressure on the wall at D C, remembering that, $x = $ M K; where M the centre of D C, also that,

$p = $ G I; measured at same scale as G H.

Remember to use and measure everything uniformly, that is, all feet and tons, or else all inches and pounds. The wind-pressure on an isolated chimney or tower is calculated similarly, except that the neutral axis is central between the walls, instead of being on the wall itself; the following example will fully illustrate this.

Example.

Wind-pressure on Chimney. *Is the chimney, Figure 87, safe against wind-pressure?*

We need examine the joints A and E only, for if these are safe the intermediate ones certainly will be safe too, where the thickening of walls is so symmetrical as it is here.

The load on A we know is 47 tons, while that on E is 657 tons.

Now the wind-pressure down to A is:

$$P_a = 10.30.15 = 4500 \text{ lbs., or } = 2\tfrac{1}{4} \text{ tons.}$$

On base joint E, the wind-pressure is:

$$P = 12\tfrac{2}{3}.150.15 = 28500 \text{ lbs., or } = 14\tfrac{1}{4} \text{ tons.}$$

We can readily see that the wind can have no appreciable effect, but continue for the sake of illustration. Draw P_a horizontally at half the height of top part A till it intersects the central axis G, ; make G, H, at any convenient scale = 47 tons, the load of the top part; draw H, I, horizontally, and (at same scale) $= 2\frac{1}{4}$ tons = the wind-pressure on top part; draw G, I, ; then will this represent the total pressure (from load and wind) at K, on joint A A_1.

Use Formula (44) to get the stress at A, where $x = $ K, M, $= 9''$, or $\frac{3}{4}$ feet; and $p = $ G, I, , which we find scales but little over 47 tons; and Formula (45) for stress at A. For d the width of joint we have of course the diameter of base, or $10\frac{2}{3}$ feet. Therefore

$$\text{Stress at } A_1 = \frac{47}{39} + 6.\frac{47.\frac{3}{4}}{39.10\frac{2}{3}} = +1{,}71 \text{ tons, per square foot, or } \frac{1{,}71.2000}{144} = +24 \text{ lbs. (compression), per square inch, and}$$

$$\text{stress at } A = \frac{47}{39} - 6.\frac{47.\frac{3}{4}}{39.10\frac{2}{3}} = +0{,}7 \text{ tons, per square foot, or } \frac{0{,}7.2000}{144} = +10 \text{ lbs. (compression), per square inch.}$$

To find the pressure on base E E_1; draw P G horizontally at half the whole height; make G H = 657 tons (or the whole load) and draw H I horizontally, and $= 14\frac{1}{4}$ tons (or the whole wind-pressure). Draw G I and prolong till it intersects E E_1 at K. From formulæ (44) and (45) we get the stresses at E_1 and E: p being = G I = 658 tons; and $x = $ M K $= 20''$, or $1\frac{2}{3}$ feet. For d the width of base we have the total diameter, or 16 feet. Therefore stress at $E_1 = \frac{658}{151} + 6.\frac{658.1\frac{2}{3}}{151.16} = +7$ tons per square foot, or $\frac{7.2000}{144} = +97$ lbs. (compression), per square inch, and stress at $E = \frac{658}{151} - 6.\frac{658.1\frac{2}{3}}{151.16} = +1\frac{2}{3}$ tons (compression), per square foot, or $\frac{1\frac{2}{3}.2000}{144} = +23$ lbs. (compression) per square inch.

There is, therefore, absolutely no danger from wind.

Strength of Corbels. Corbels carrying overhanging parts of the walls, etc., should be calculated in two ways, first, to see whether the corbel itself is strong enough. We consider the corbel as a lever, and use either Formula (25), (26) or (27); according to how the overhang is distributed on the corbel, usually it will be (25). Secondly, to avoid crushing the wall immediately under the corbel, or possible tipping of the wall. Where there is danger of the latter, long iron beams or stone-blocks must be used *on top* of the back or wall side of corbel, so as to bring the weight of more of the wall to bear on the back of corbel.

To avoid the former (crushing under corbel) find the neutral axis G H of the whole mass, above corbel, Figure 95; continue G H till it intersects A B at K, and use Formulæ (44) and (45).

If M be the centre of A B, then use $x = $ K M, and $p = $ weight of corbel and mass above; remembering to use and measure all parts alike, that is, either, all tons and feet, or all pounds and inches.

Example.

Calculation of corbel. *A brick tower has pilasters 30″ wide, projecting 16″. On one side the tower is engaged and for reasons of planning the pilasters cannot be carried down, but must be supported on granite corbels at the main roof level, which is 36 feet below top of tower. The wall is 24″ under corbel, and averages from there to top 16″, offsets being on both sides, so that it is central over 24″ wall. What thickness should the granite corbel be?*

If we make the pilaster hollow, of 8″ walls, we will save weight on the corbel, though we lose the advantage of bonding into wall all way up. Still, we will make it hollow.

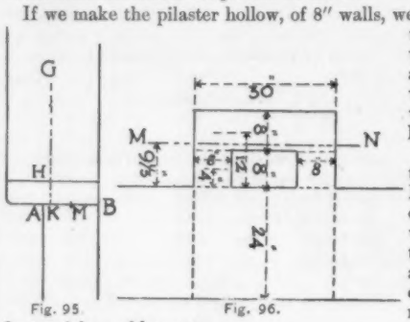


Fig. 95. Fig. 96.

First, find the distance of neutral axis M – N (Figure 96), of pilaster from 24″ wall, which will give the central point of application of load on corbel. We use rule given in the first article, and have

$$x = \frac{8.30.12 + 8.8.4 + 8.8.4}{8.30 + 8.8 + 8.8} = 9\tfrac{1}{3}''$$

The weight of pilaster (overlooking corbel) will be 6624 lbs., or $3\frac{1}{3}$ tons.

Assuming that only 30″ in length of the wall will come on back part of corbel, the weight on this part would be 8640 lbs., or $4\frac{1}{3}$ tons.

The bending moment of 6624 lbs. at $9\frac{1}{3}''$ from support on a lever is (see Formula 27):

$$m = 6624.9\tfrac{1}{3} = 61824 \text{ (lbs. inch).}$$

From Formula (18) we know that:

$$\frac{m}{\left(\frac{k}{f}\right)} = r$$

From Table I, Section Number 3, we have:

$$r = \frac{b.d^2}{6} = \frac{30.d^2}{6} = 5.d^2$$

And from Table V, we have for average granite:

$$\left(\frac{k}{f}\right) = 180$$

Inserting these values in Formula (18) we have:

$$\frac{61824}{180} = 5.d^2, \text{ or } d^2 = \frac{61824}{900} = 68{,}7, \text{ therefore, } d = 8\tfrac{1}{3}''.$$

We should make the block 10″ deep, however, to work better with brickwork. This would give at the wall a shearing area $= 10.30 =$ 300 square inches, or $\frac{6624}{300} = 22$ lbs., per square inch, which granite will certainly stand; still, it would be better to corbel out brickwork under granite, which will materially stiffen and strengthen the block.

Pressure under corbel. To find the crushing strain on brick wall under corbel, find the central axis of both loads by same rule as we find centre of gravity; that is, its distance A K from rear of wall will be (Figure 97)

$$\frac{4\frac{1}{3}.12 + 3\frac{1}{3}.33\frac{1}{3}}{4\frac{1}{3} + 3\frac{1}{3}} = 22\tfrac{1}{4}''$$

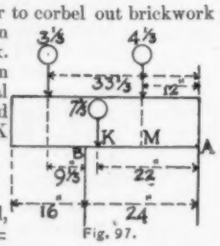


Fig. 97.

or, say, 22″, the pressure at this point will, of course, be $= 4\frac{1}{3} + 3\frac{1}{3} = 7\frac{2}{3}$ tons, or $p =$ 15340 lbs.

The area will be $= 24.30 = 720$ square inches, while K M measures 10″; we have, then, from Formulæ (44) and (45) stress at

$$B = \frac{15340}{720} + 6.\frac{15340.10}{720.24} = +74 \text{ lbs. (compression), and}$$

$$\text{stress at } A = \frac{15340}{720} - 6.\frac{15340.10}{720.24} = -31 \text{ lbs. (tension).}$$

There would seem to be, therefore, some tendency to tipping, still we can pass it as safe, particularly as much more than 30″ of the wall will bear on the rear of corbel.

If the wind could play against inside wall of tower, it might help to upset the corbel, but as this is impossible, its only effect could be *against* the pilaster, which would materially help the corbel against tipping.

Louis DeCoppet Berg.

[To be continued.]

A Garbage Destructor.—The garbage crematory at Wheeling, W. Va., is said to be completed, and to have stood the tests which have been applied to the satisfaction of the authorities. Pittsburgh, Penn., is also endeavoring to solve the difficult problem of the disposal of garbage, and has advertised for bids to construct furnaces. We regret to learn that the Milwaukee, Wis., authorities, have decided to remove the garbage of that city to the country, and there bury it in the ground. Such a method of disposal is, at the best, unsanitary, and can be but a temporary relief.—*Science.*

COMMUNICATIONS

THE PRACTICAL VALUE OF GROUTING.

NEW YORK, N. Y., June 10th, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—It is quite evident, as Mr. Berg confesses, that he is unable to answer my protest against his unsupported assertion that "practically, grouting makes the *best* work except in freezing weather." I had no intention of omitting the word *except* from his sentence. The exception has no bearing upon the question at issue. Colonel Sedden says very clearly that grouting is advisable in some cases, as a makeshift, as an expedient where regular mortar-work has been improperly done, but no one could possibly construe his remarks to mean or imply even that grouting makes the *best* work. Clearly the issue is, "Practically does grouting make the *best* work that can be done?" My position is this: 1st. Grouting is to be regarded as an expedient only. 2d. Where it is possible to use neat cement as a mortar, grouting is never equal to the best cement-mortar for any kind of work whatever. 3d. In the preparation of grouting the smaller the amount of water used the stronger the grout will become. 4th. Grouting should never be made of any materials but neat cement.

In support of the last two declarations I cite the concurrent testimony of Mr. W. R. Kinipple, M. I. C. E., who says, (see "*Proceedings of Inst. Civ. Eng'rs., Vol.* 87, *page* 183"): "Mixtures of cement and sand for grouting purposes had sometimes been adopted by engineers, but it was *most injudicious* to use such, as when reduced to the form of grout, especially thin grout, the materials, instead of remaining as a mixture, separated into layers, thus: 1st, or bottom layer, sand; 2d, coarsely-ground particles of cement; 3d, cement, with setting properties greatly reduced; 4th, lime, etc., in a creamy condition, separated from the cement through stirring in making up the grout. *Failure was certain* to follow the use of a mixture of sand and cement for grouting purposes."

This conclusion practically condemns grouting, for, by the term as generally understood, grouting means a fluid mortar of cement and sand. Mr. Kinipple employed a paste or very thick grout of neat cement, and it had proved successful as an expedient, but nowhere did he indicate that he would have used it in preference to neat cement-mortar had it been possible for him to overcome the mechanical difficulties in using the neat cement-mortar in the kind of work he had to do.

Mr. William E. Worthen, C. E., does not approve of the use of grouting, for he says, "Some lay the rubble dry and fill in with cement-grout or cement-mortar made liquid to flow into the interstices, but the sand is apt to separate and get to the bottom of the course." See "*Appleton's Cyclopedia of Technical Drawing*," page 189.

In support of my first and second declaration I cite two authorities well known to American and European engineering circles, viz.: 1st. The gentleman who is now Consulting Engineer to the New Croton Aqueduct Commission, and who was for seven years Resident Engineer to the Additional Water-Supply for the city of Boston, says: "It is absurd to suppose that grouting makes the *best* work practically; it is only to be used as a makeshift." And more than that, he is of the opinion that grouting should never be used for masonry that is under water-pressure. 2d. Mr. Joseph P. Davis, late Chief Engineer of the Boston Additional Water-Supply, and at one time Consulting Engineer to the New Croton Aqueduct Commission, at its inception, and by whose advice and counsel the specifications were prepared for the new aqueduct, a work involving the expenditure of over $14,000,000, and the most colossal work of masonry ever undertaken in this country, distinctly states in all the various books of specifications, without even one exception, that "*no grouting of joints will be allowed.*" In order that there can be no possible misunderstanding upon this point, I quote the passage, section and paragraph in full, viz.: "The stones must be well bedded in the mortar and care must be taken to fill solid all the joints. NO GROUTING OF JOINTS WILL BE ALLOWED." See "*Masonry Specifications for the* 135*th Street Gate-House, New York*, section 15, paragraph 45, page 16.

Is it not now in order for Mr. Berg to explain why grouting is so emphatically *condemned* in the greatest public work ever undertaken in America? I am unable to find any authority either among American, English, German or French engineers who will admit that grouting makes the *best* work practically; the best that can be said of it is that it is a makeshift only, and that many of our best engineers condemn its use, but I forbear to quote any more authorities, for they are without number. Mr. Berg says that the other authorities I quote all but prove his statement (which, by the way, he has been careful to quote incorrectly). He did not say "that grouting practically is good," but "practically it makes the *best* work," see *American Architect*, No. 593, page 224. There is a vast difference between merely *good* and *best*. I suppose he refers the alleged confirmation particularly to "*Rivington's Notes on Building Construction*," Vol. 3, page 197, which says just as I quoted: "Grout is deficient in strength and *should not be used* where it can be avoided." It does not regard grout as even *merely good*. How could language be more condemnatory than to say it is deficient in strength?

Finally, if Mr. Berg expects his articles on "Safe Building" to be of any value to or carry any weight with professional men, he must cite his authorities for every statement that rests upon debatable ground. His citations of authorities so far have been conspicuous by their absence. In his Table No. 5, I am unable to find any tests of the strength of grouted masonry, but if grouting makes such alleged superior work, why was it omitted? Such an omission is highly inconsistent. Surely there was no lack of examples; even the writer's alleged limited knowledge is able to supply a few. As Mr. Berg has failed to substantiate his statement by citing any authority that agreed with him, and then succeeded in quoting himself incorrectly by way of explaining his untenable position, I find that I must still maintain my unequivocal exception to the statement that "Practically grouting makes the *best* work."

I trust you will do me the honor to publish my reply in full.

Yours very truly, C. POWELL KARR, C. E.

NEW YORK, June 16, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In the last issue of your valuable paper, I notice a controversy between Messrs. L. DeCoppet Berg and C. Powell Karr as to the fact whether "grouting masonry, except in freezing weather, makes the best work *practically*." Having been connected for a number of years with a concern which has large building interests in New York and vicinity, it occurred to me that it would not be considered presumtuous by either of the above-mentioned gentlemen if I should state its experience, which embraces a period of forty years.

In the first place we contend, from practical observation and test, that masonry CAREFULLY grouted when the temperature is not lower than 40° Fahrenheit, will give the most efficient result. A forcible illustration of this occurred on a store building which we erected, wherein some of the piers had been grouted and others laid up without this method. Two years after completion of the work, a fire destroyed it and some of the piers were removed. Those that had not been grouted were removed with comparative ease, but the grouted piers had to be wedged at the bottom and were thrown bodily to the ground, remaining intact, though having fallen a number of feet in height. They were then broken apart by means of wedges and sledge hammers and not one brick could be used again, the break almost invariably occurring through the brick, not at the joint. At various times we have cut openings through grouted walls and others not so treated, and, without exception, the most time and labor was spent where the masonry had been grouted. The union between the brick and mortar in properly grouted work is so perfect that they become one mass, and, as it were, one stone. Perhaps this becomes more evident when it is known that grouted work takes fully one-fifth more mortar. It is true that if grouting is improperly done, the fears of Mr. Karr would be realized, but with the proper kinds and quantities of materials and careful workmanship, no masonry can compete with a like piece of grouted work.

To show that many of the most prominent architects and builders have the same opinion, I append a list of a number of the heaviest and best-known structures in this city, which to my certain knowledge have grouted walls, viz.: Metropolitan Opera House, Produce and Cotton Exchanges, Mortimer and Mills Buildings, Equitable and Mutual Life Insurance Buildings, Standard Oil Building, Astor Building, Schermerhorn Building, Gallatin Bank Building, Seaman's Savings Bank, Central Trust Company Building, Seventh Regiment Armory, Eagle Fire Insurance, Gorham Building, Steinway Hall, The Eden Musée, The Dakota Apartment Building, several tanks of the Consolidated Gas Company, The Navarro Buildings, Manhattan Bank Building, Lenox and Astor Libraries, the Presbyterian, German, St. Vincent and Woman's Hospitals, etc. Furthermore, one of the greatest pieces of masonry in the world, the Mersey Docks and Warehouses at Liverpool, England, have been grouted throughout.

Respectfully yours, OTTO M. EIDLITZ, C. E.

RECTOR PIERSON, FIRST PRESIDENT OF YALE COLLEGE.

EVERGREEN HOME, ONARGA, IROQUOIS CO., ILL., June 10, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In the monthly number of the *American Architect* of June 4th, under the head of "Early Settler Memorials," I find statements in relation to Rector Pierson, the first President of Yale College, that are quite remarkable as specimens of historical inaccuracies. The writer states that "The old red sandstone tablet erected to the Rector in the cemetery at Clinton, Conn., bears the following inscription:

> 'In memory of Worshipful Abraham Pierson, Esq.,
> Who died Jan. 8, 1752, in his 79th year.'"

The notable mistake or inaccuracy here is found in the fact that this old red sandstone tablet in the cemetery at Clinton was erected in memory of Abraham Pierson, Esq., an old colonial magistrate, and the eldest of the three sons of the Rector, and *not* to the Rector himself, as represented in the article referred to.

Mistake No. 2. Abraham Pierson, the Rector, died in 1707, at

the age of sixty-six, and *not* "in 1752, in his 79th year," as represented in the aforesaid article.

Mistake No. 3. The aforesaid article represents Gen. William A. Pierson of Windsor, Conn., as being the only living male descendant of Rector Pierson, the first President of Yale. The fact of the matter is that Gen. William S. Pierson was, when alive, one of the many hundred of now living male descendants of Rector Pierson.

Yoars truly,

William P. Pierson.

Notes and Clippings

Scandanavian Engineers.— A gentleman who has given the matter careful attention predicts that the civil engineering of the Northwest will soon be done to a great extent by young Scandinavians, graduates from the polytechnic schools of Europe. He bases this opinion upon the fact that there are no less than 30 Scandinavian engineers employed in the railway offices and engineering departments of St. Paul and Minneapolis alone, nearly all of them men of fine attainments and thoroughly versed in their chosen profession. Many important public improvements in both cities have been completed under the supervision of this class of engineers. — *St. Paul Pioneer Press.*

One Safe Theatre.— People who want to enjoy a play in peace of mind will have to go to Belgium. The new Flemish theatre in Brussels promises, when completed, to afford every guarantee of safety which the most timid play-goer could desire. The materials employed in its construction are stone and iron; and, though it will be impossible to dispense with woodwork altogether on the stage, all the timber used will first be rendered absolutely incombustible. Two broad flights of stairs, one at each side of the main entrance, lead to the grand circle and the *foyer*, which are on the first floor. The three upper tiers have each its own independent stairway opening directly on the street. The building is provided with twelve different outlets; nine for the egress of the spectators and three for that of the *personnel*. But the most original feature in the construction is the system of external balconies or outer-galleries, corresponding to those in the interior of the building, with which they communicate by no fewer than a hundred different doors — twenty-five to each tier. These balconies are further connected with each other by iron stairs of good width and easy descent, and the lowest of the four is capacious enough to give standing-room to the entire audience. — *St. James' Gazette.*

The Rubbish Heaps of Naucratis. — Time, which has destroyed all that was splendid in the temples of Naucratis, the marble pillars, the cultus-statues, the dedicated vessels of gold and silver, has made some amends by preserving to us their rubbish heaps. It was the custom of the city that Greeks who entered Egypt by that way should dedicate to the patron deity, under whose protection they voyaged, a statuette or vessel of pottery in memory of a safe journey. On the object so dedicated they would inscribe the name of the donor. And as from time to time the temples became too full of these pious offerings, the temple officers would dig a trench and bury all that they judged to be superfluous, breaking them up for economy of space. Out of such trenches Mr. Petrie and Mr. Gardner have extracted thousands of fragments of pottery painted with figures or inscribed with dedicatory formulæ, besides many statuettes, mostly fragmentary also. To build up these fragments into vases, nearly or partly complete, is a laborious task, which is now in progress, and of which the results can scarcely fail to be valuable. We shall acquire a long series of inscriptions for the epigraphist, and for the archæologist a quantity of vases which can be dated by means of the inscriptions which they bear. And we shall acquire a sort of visitors' album, a record of the Greeks who went to Egypt, from the foundation of the city under Psammitichus down to the Persian conquest, when these dedicatory customs seem to have been discontinued. Mr. Gardner has already made public one name of no ordinary interest, which he has deciphered, that of Rhœcus, probably the same sculptor Rhœcus who was in antiquity spoken of as having worked in the Egyptian style, and who was, at the same time, with his son Theodorus, one of the originators of the production in Greece of statues of divinities. In another case we seem to find the name of Sappho, whose brother, if not herself, is known to have journeyed to Naucratis. On one large vessel we read the name of Phanes, the son of Glaucus, whom Mr. Gardner can scarcely be wrong in identifying with the Greek captain of mercenaries who led Cambyses into Egypt.— *The Quarterly Review.*

Checking Jerry-Building in Rome.— A novel strike is threatened in Rome. The construction of houses in the new part of the city, and especially in those sections which have been demolished and rebuilt, has been carried on under regulations so bad, or so easily evaded, that the new quarter is the most disgraceful appendix to a great city to be found in all Europe. The houses are huge, tasteless, stucco palaces, so high as to shut off the sunlight, necessary above all things in Rome, from the lower stories of the houses opposite. They are ill-constructed, so that, in more than one case they have fallen into the spaces in front of them, and flimsy and ill-contrived, so that one hears the common domestic sounds from apartment to apartment and from story to story. There is the least possible attention to the sanitary requisites which decency would permit — in short, the quarter is a huge congeries of "jerry" dwellings, built on speculation, in which no person who regards personal comfort would continue to reside except on compulsion, and it is in general, æsthetically and economically, a disgrace to Rome. To this condemnation there are but few exceptions, so that the new Rome is compromising the character and injuring the future prosperity of the capital. The municipality, becoming finally awake to the state of affairs, has enacted new and more rigorous regulations for future construction, which will in part prevent such monstrous failures as some of those now visible. The contractors and speculators have called a general meeting to protest against this interference with the acquired rights and interests of the building trade. They threaten disorders among the workmen, and decline all responsibility for them when they arise owing to the stoppage of the works. Building has been a huge speculation here for years past. The subject is of incalculable importance to the future of Rome.— *London Times.*

Trade Surveys

One of the many favorable indications of healthful activity is that nearly all of the railroad companies of the United States are making or preparing to make extensive purchases of material, motive-power, land and rolling-stock. Materials, such as iron, steel, spikes, bolts, lumber, stone, are needed to extend contemplated mileage. Motive-power is needed in shops and on the roads. Repairing requirements are very much larger than a year ago. The locomotive-makers and makers of boilers, engines, presses, lathes, etc., have much business in hand. Many railroad companies are acquiring additional land for future shop needs and for various purposes. Large orders have been given out during the past two weeks for rolling-stock and for cars suitable for iron, steel, ore, coal, lumber, oil, etc. The Western car-builders have been asking Eastern builders to divide their work and help them out. Eastern builders have been offering work to Western car-wheel and car-axle makers. Merchant-steel and Bessemer-steel makers have only recently experienced a slacking in demand. Taking out the enormous railroad requirements, the phenomenal activity of all markets would disappear, prices would decline, and the snap that characterizes everything in trade would be wanting. Railroad earnings are over seven-and-one-half per cent this year in excess of last year to this date. The volume of bank-cleanings this year to date are fifteen per cent in excess of last year. Real estate has advanced in value. House-building operations have increased. Demands for all kinds of material is stronger, and the autumn and winter prospects continue favorable. The increase of money within a year is equal to $70,000,000. Had it been double this, damaging speculation might have followed. The supply of money will probably increase, and only the least possible amount will be retained in idleness. Traffic and exchanges are lighter at the turn of the half year than earlier and later. An unusually large amount of business is hanging fire in iron, lumber, coal, cotton, woollen stocks, and in contracts for the requirements of the last half of the year. Building interests thus far have been protected against fluctuations in values. An attempt will be made next month, it is said, in the Northwest, to advance lumber $1 per M. Eastern markets have been stocked fully, but the Western markets will continue to absorb Michigan lumber freely. The shipments of dry lumber during the month of June exceeded all previous records, and certainly all anticipations of manufacturers and shippers. No decline in lumber prices is probable. Southern shipments are large, and the rail-traffic in lumber is increasing. The interior demand, especially from the smaller manufacturing towns, continues very large. The anthracite-coal trade is 1,500,000 tons in round numbers, ahead of the production at this date last year. The bituminous output, if properly tabulated, would show a relatively greater increase. The increase of two Pennsylvania coal fields, Clearfield and Broad Top, and one Virginia field, shows an increase of 1,000,000 tons over the production at this time last year. The Western coal fields are doing well, and in the far West mines will be opened for railroad, manufacturing and domestic supplies at numerous points. Recorded railway-construction is put at 1688 miles this year as against 1271 same time last year, but these figures do not include a great deal of side-tracking and repairing which, if reported, would show twice that amount of actual track-laying. The rail-mills have contracts for the delivery of 800,000 tons this year, and of an immense amount of winter bridge work. The iron-workers have made demands for higher wages, which will strain the generosity of employers to grant. The coke-workers at this hour are still stubborn. New sources of supply will be in operation as early as October, but Connelsville will always command the market.

The half year has been a busy one among architects and builders. A summary of new building operations for the past month shows that the average is being preserved. The last half of the year will be even more active. Matters are unsettled at Chicago, and in some lines farther west strikes have occurred, but no very serious results are now anticipated. Labor will make the best of its opportunities for the rest of the year. Employers have exhibited the necessary determination to contest unjust demands, and a less arbitrary spirit among workmen is the result. Labor leaders admit that there is a growing conservatism, or, as they put it, lethargy among a large percentage of the membership. Returns from twenty-six cities, large and small, show an increase of nearly twenty-five per cent in amount expended for the first five months of this year as against same time last year, and an increase of forty per cent in real estate transactions. The great rush in Western real estate is over for the present. Speculators have taken counsel with experience, and are waiting for progress in business. The country will not follow blindly in the lead of wild speculators. The greatest industrial activity will be developed in the Mississippi valley, and Chicago will control the greatest distribution which it will bring about. Small manufacturing concerns are multiplying West and South, and far Western markets are being built up. The Eastern jobbing centres are fully prepared for the early opening of the autumn trade. Machinery orders continue to multiply, when but a minimum of business is to be expected. The midsummer season will be more active than usual. Hardware manufacturers have had a busy June month. Electricians and electrical supply-houses are very busy, and not a few are working at nights. The orders for such products as nails, chains, rods, paints, pipes, tools, and a score of other minor articles, are unusually large. The stove-makers have large orders on hand, and have distributed the bulk of last winter's castings. Foundry work is active, and foundry irons are scarce and dear. Rolling and plate mills are slack. Bridge mills and works are overcrowded. Textile mills on cotton goods are quite busy, but on novel products, slack. Paper mills everywhere, especially those on book-paper, are very busy. The publishing-interests and press-room managers are unusually busy by way of preparing printed matter for the fall trade. Agricultural implement-makers are pushing a little cautiously, except where manufacturers have an assured trade. The overdoing limit has not been reached, in fact, is not in sight — yet prudence is necessary to prevent a clogging of the channels of production. The attempted stock speculations and cornering of staples exhibit the strength of the markets, the abundance of supplies, and the quiet confidence of the people in their ability to control their own interests against speculators.

The American Architect and Building News

ADVERTISERS' TRADE SUPPLEMENT.

No. 61. SATURDAY, JULY 2, 1887. VOLUME XXII. No. 601.

PERFECTION IN ROOFING.

Two very important events have recently occurred which will be interesting to every architect, as well as to the trade in general.

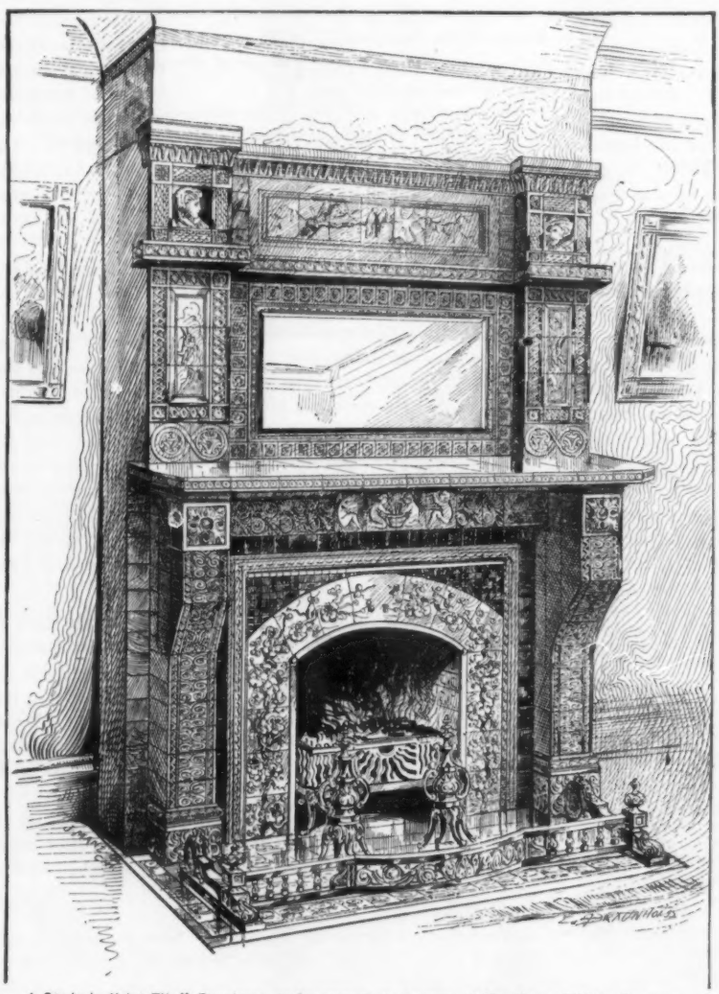
Messrs. N. & G. Taylor Company, the well-known tin plate and metal importers of Philadelphia have lately been awarded two contracts of special significance: one is for supplying the tin for roofing the Grand Union Railway Station at Indianapolis. This is of so large a magnitude and so important an award that it forms the topic of general conversation among the trade. Fifteen prominent railroads will centre in the immense structure, the total cost of which will exceed $1,000,000. The award to Messrs. N. & G. Taylor Company is for their "Old Style" brand of roofing tin. This brand is unquestionably among the finest roofing-tin in the market to-day. Every sheet is made by the old manner of hand-dipping, as first made in Philadelphia in 1830, and sold by this firm. It is thus called the "Old Style" brand, double-coated and hand-dipped.

To fulfil this contract it will take some 500 boxes of the 28 x 20 inch, or 1,000 boxes of the 14 x 20 inch size-terne, there being in all some 150,000 square feet of surface. This is the largest contract ever awarded for so fine a grade of roofing-tin, and it is a significant fact that in this age of deceptions, cheap qualities and imitations, especially in roofing-tin, so decided a preference should have been expressed from so high a source in favor of the "Old Style" brand over all competitors.

Messrs. N. & G. Taylor Company have also been awarded the contract for supplying the tin for roofing old Independence Hall in Philadelphia. The award was made in favor of the "Old Style" brand over all competitors, and it is interesting to know that this well-preserved relic of Revolutionary times should be covered with this "Old Style" brand of roofing-tin.

These decisions and awards in the face of keen competition are certainly very flattering to this old and enterprising firm, and the respective cities are to be congratulated upon securing such a fine and durable material.

In connection with the above, a few facts relating to the history of the "Old Style" brand will, no doubt, be interesting to your readers.



A Study in "Art Tile" Fireplaces, to be seen at show-rooms of The Henry Dibblee Company, 266 and 268 Wabash Avenue, Chicago, Ill.

That architects may better understand the merits of this fine brand, Messrs. N. & G. Taylor Company state that roofing-tin made with what is known as a "terne" coating (the word itself being old French for *dull* in contradistinction to *bright* tin) was first made in Philadelphia in 1830 in a very crude way, but of the very finest materials. The idea of a "terne" coating was quickly adopted by the Welsh manufacturers, and each succeeding year witnessed the introduction of improved machinery and experience. After the close of the war, in 1865, a large demand sprang up for tin plates of every description, and in many cases the standard of roofing tin was considerably lowered. While there was, of course, some demand for fine plates, yet the popular bent came generally for cheaper goods, and to cater to this want qualities were debased and values correspondingly reduced. The cost per foot for covering the roof at that period was scrutinized more than the intrinsic quality of the material itself. Excessive competition among the American trade rapidly led to deterioration, and Welsh and English manufacturers unloaded their inferior plates upon our market to such an extent that there began to be manifested a marked decline in the popularity of tin for roofing, and the extinction of the article itself for first-class work was actually threatened.

About 1873, when it seemed almost impossible to make anything poorer, and still retain the appearance of roofing-tin, Messrs. N. & G. Taylor Company decided to take a directly opposite stand, and to have made the very highest grade of roofing-tin possible without restriction as to cost or appearance.

They immediately entered into negotiations with their old friends, the Copper Miners' Tin Plate Company, and Messrs. Leach, Flower & Company, two of the most reliable tin plate makers and the manufacturers of the finest stamping plates known, and arranged with them for its production. The words "Old Style" were selected for a brand, as they had never before been used on any plate, and

would not conflict in any way with any maker's brand. The process was by the old manner of hand-dipping, allowing the plate to absorb all the coating it could possibly take up and penetrating every pore. This brand — destined to be the leading one in the history of the trade — sprang into immediate favor and created havoc among the dealers in cheap brands. Competition was keen, however, and some of the trade were led to acts that could not come within the sphere of equity and fair dealing; in other words "imitations" were brought out and sold under names similar to the "Old Style." Such a thing as a manufacturer copying or using a brand belonging to another was unknown in the history of the trade up to this time, and Messrs. N. & G. Taylor Company were then forced, not only for their own protection, but also in the interest of the trade, to have the "Old Style" brand registered (No. 26,626) in the English courts, which was accordingly done. The trade-mark of the "Target and Arrow" is long familiar to the buyers of this brand, but to further protect consumers the top and bottom sheet in every box were stamped with the brand and name of Messrs. N. & G. Taylor Company. A small illustrated tin card was also packed in every box, and their present system of guaranteed brands was then inaugurated.

The brand rapidly increased in popularity, and its success was unbounded, but before many years Messrs. N. & G. Taylor Company were surprised to find their registered brand of "Old Style" deliberately appropriated, and that, too, by a manufacturer who coupled it with his own inferior brand! As litigation is tedious and expensive, Messrs. N. & G. Taylor Company decided to let this "imitation" be sold, and allow the trade to be the judge of the equity of the case. It is sufficient to say that, like all inferior goods that are foisted upon the market in imitation of a genuine article, it has sunk into insignificance and died a natural death.

Other "imitations" naturally followed, and various plates branded "old process" "old method" "treble coated" "extra coated" etc., began to be imported, and although they claimed the appearance, as far as possible, of the "Old Style" they, of course, lacked the characteristics of the genuine brand itself. Some of these were made of common iron, with a heavy coating, to be sure, but largely composed of lead, which, without a proper admixture of tin, is not a durable coating. Another device consisted in having the sheets of iron or steel rolled a trifle thicker, so that when coated they would apparently seem much heavier than the standard thickness. The *coating* is the test of durability, not the thickness of the iron or steel. These imitations could, of course, be sold far below the cost of the "Old Style" brand, and thus favored the dealer by allowing him a wide margin of profit, but they made the consumer the sufferer and the property-owner the victim.

Messrs. N. & G. Taylor Company still maintained, through this kind of competition, the integrity of their brand, and refused to reduce its quality in any particular, although had they done so the sale would have been increased four-fold; but they had set out to furnish the *very best* that could be made at any price, irrespective of cost, and it is to their credit that they have not shirked this responsibility.

Finding that something further must be done to protect the trade, they officially announced in a circular-letter of July 1st, 1884, addressed to architects, builders, roofers, and dealers generally, that they had decided to stamp every perfect sheet of the "Old Style" brand with the name of the brand, thickness, the trade-mark, and the name of N. & G. Taylor Co., and instructions were immediately given to have *every perfect sheet only stamped.*

Particular mention is made of this fact as the "imitations" were quick to follow, and some rival brands were stamped in Philadelphia. The important fact is thus established, that to Messrs. N. & G. Taylor Company belongs the honor of originating and introducing to the trade stamped and guaranteed roofing-tin, and to this day their plates are the only ones bearing the name of the *guarantor.*

Although beset on all sides by keen competition, the genuine "Old Style" brand has always been sold upon its *merits*, and has steadily advanced in popular favor, and to-day stands at the very pinnacle of success, *a perfect roofing-tin in every way*, and commends itself to architects where first-class material is required.

N. & G. TAYLOR CO.,
PHILADELPHIA.

THE GLOBE VENTILATOR.

It is indispensable for curing smoky chimneys, and for improving the draft in sluggish flues. It acts as a Sanitary Agent in ventilating soil-pipe and removing sewer-gas.

It is extensively used for ventilating School-Rooms, Halls, Churches, Stores, Theatres, Factories, Cars, Yachts, and apartments of every description.

Neither snow nor ice can lodge on it, and the wind cannot get under it and twist its parts out of place, as in other ventilators.

It is made of heavy galvanized iron and does not rust, or work loose, or become clogged with cinders or soot.

The Globe is sold cheaper than any other ventilator. It is the simplest in construction of any made. It will work at any angle, whether horizontal, perpendicular, or oblique. It is the most rigid of any and will not get out of order. It is storm and cinder proof, durable, and noiseless. No current of air can produce other than an outward draft, thus insuring perfect operation. Every house should have one or more of these ventilators on its chimneys and soil pipe. It protects the chimney by keeping out the snow and rain.

THE GLOBE VENTILATOR CO.
TROY, N. Y.

METALLIC SKYLIGHTS.

Our Patent Metallic Skylight has met the approval of architects and engineers who have examined and used it.

Its strength and simplicity of construction are readily recognized, and the very satisfactory experience with the hundreds we have erected here and elsewhere, makes good our claim of superiority.

It is particularly adapted for buildings where large, continuous lights are required, as on railroad depots and shops, factories, mills, conservatories, etc.

We make special claims for our cap with the strip of lead attached, which lays close to the glass, making it practically water-tight, but should any leakage occur through the cap, it will only find its way into the open tubular bar or gutter and pass out to the roof.

The peculiar construction of our bar furnishes an elastic bed for the glass to rest on, and not using putty or cement, the dangers of expansion and contraction of metal and glass are entirely overcome; then again the breakage of glass by vibration of train-sheds and buildings is avoided, as our experience has proved.

Condensation is provided for by a cross gutter which connects with the tubular bar.

The construction being entirely of metal and well riveted, makes it fireproof.

A broken light can be readily replaced by loosening the copper cleats and removing the cap.

Among the large contracts we have completed are the skylights on passenger-building, train-sheds, and freight-warehouse of the Atlantic Coast Line, at Richmond, Va., which aggregate about 10,000 square feet of glass.

We solicit correspondence.

VAILE & YOUNG,
BALTIMORE, MD.

NOTES.

The magnificent Ponce de Leon Hotel at St. Augustine, Fla., now nearly completed and said to have cost upwards of $2,000,000, covering nearly three-and-a-half acres, is built entirely of artificial stone made in St. Augustine from Hanover Portland Cement mixed with the natural shell deposits so abundant in that locality. Over 40,000 barrels of this cement have already been used in its construction. The appearance of this artificial stone has such an antique and solid look, is in such good keeping with the old buildings of that historic town, and is so greatly admired, that a large memorial church made from the same material is also erecting. The Hanover cement contains 400 pounds to the barrel and is so evenly and finely ground that it stands more sand than any other cement in the market and hence is the most economical. The sole importers and agents in the United States are

BAETJER & MEYERSTEIN,
5 DEY ST., NEW YORK.

The Wainwright Manuf'g Co., 65 and 67 Oliver Street, Boston, note the following shipments of their Corrugated Tube Exhaust Feed-Water Heaters during the month of June: — 4 in Boston, 2 to New York City, 1 each to Whitman, and North Adams, Mass., East Buffalo, N. Y.; Cumberland Mills, Dexter and Bar Harbor, Me.; St. Joseph, Mo.; Decatur, Ill.; and Weimar, Texas.

They are booking orders for these heaters very fast, and note one or two of 1000 H.P. each, recently sent them by the largest manufacturers of iron in Western Pennsylvania.

Attention is directed to the roofing on the handsome row of brown-stone houses on the south side of 76th St. between 9th and 10th Aves., N. Y., now being erected by Demeron & Smith. We learn that they are the Walter's Patent Shingle, made by the National Sheet Metal Roofing Co., 510 to 520 East 20th St. We understand that although they are handsomer, lighter and more easy to put on than slate, they are much cheaper, which should commend their use to architects and builders.

BOSTON, MASS., June 1, 1887.

To the Eds. of the American Architect: —

Dear Sirs, — We have the pleasure of stating that the Rice & Whitacre Mfg. Co., 42 and 44 West Monroe Street, Chicago, Ill., have assumed the Agency for the sale of our goods in the Western and South-Western States; while Mr. M. H. Johnson, 140 Centre Street, New York, N. Y., assumes the same functions for that city.

Yours respectfully,

GURNEY HOT WATER HEATER CO.
237 FRANKLIN ST., BOSTON, MASS.

Anderson & Dickey,

ARCHITECTURAL

Wood Turning.

Spiral Moulding

Done by Machinery of our own Invention.

Patented Dec. 27, 1881.

All kinds of Newels, Stair-Posts, Balusters, Pedestals, Table and Chair Legs, etc.,

Rope-moulding & Screen-work.

All Orders promptly attended to.

41 BRISTOL STREET, BOSTON.

Architect's Designs a Specialty.

Send two-cent (2c) stamp for Illustrated Catalogue.

THE

STANDARD Wood Turning Co.,

198 Green Street, Jersey City, N. J.

MACHINE - TURNED BALUSTERS

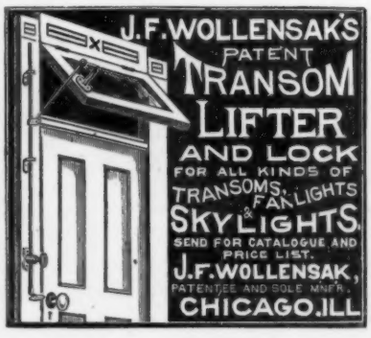
Of Various Sizes and Patterns, Dovetailed Ready for Use, with Tait's Patent Dovetail.

Pedestal and Turned Newels.

STAIR RAILS.

of all dimensions.

Send 4ct. Stamp for our 32 page catalogue containing 200 Illustrations, of Balusters, Pedestal Newels, Brackets, Drops, etc.



LEE'S

FILTERING JOINT

Prevents Soot, Leaves, Bugs, Caterpillars or dead Birds from entering the Cistern. It is the Cheapest and Best Filter ever made. It will not clog up. Always set for use. Prices and Descriptive Circulars furnished on application,

THOMAS LEE,

Patentee and Sole Manufacturer,

46 and 48 Race St., Cincinnati, O.

STAIR'S BOSTON HARD WAX - POLISH

FOR FLOORS.

E. D. STAIR, Original Manufacturer.

7 W. 14th Street, NEW YORK.

TO ARCHITECTS AND CONTRACTORS:

We desire to call your attention to the Superior quality of **Plate Glass manufactured by the**

PITTSBURGH PLATE GLASS COMPANY.

The Largest Plates of Glass in buildings in the cities of Chicago, Cleveland, Detroit, St. Paul, Syracuse, Pittsburgh, Philadelphia, Baltimore, and many New York buildings, were manufactured by our Company.

The only fuel used throughout both our works is **Natural Gas**; which, owing to its superior heating power and cleanliness, enables us to produce an article which **cannot be surpassed,** besides glass melted and annealed by our process with this gas, is far more durable and not so liable to break.

We make a specialty of three-sixteenths thickness for fine residences, also extra large sizes, wide and long plates for store fronts, beveled and obscured plates, skylight and floor glass.

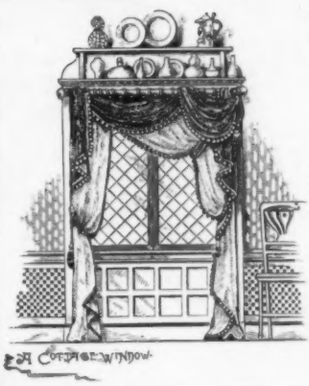
With a capacity of 260,000 square feet monthly, we are prepared to execute all orders promptly, and invite correspondence.

WORKS No. 1, CREIGHTON, PA.
WORKS No. 2, TARENTUM, PA.

Western Union Wire and Telephone connection in General Office at Creighton, Pa.

E. L. FORD, Secretary.

PAPER HANGINGS.



LINCRUSTA WALTON,

DRAPERY MATERIALS,

WINDOW SHADES, etc.

One of the largest collections of the above goods can be found at our new and elegant store, where every convenience for the selection of goods is offered.

Special attention given to the furnishing of Private Residences, Hotels, etc.

Estimates given if desired, and competent men sent to examine and execute the work.

LOWEST CASH PRICES.

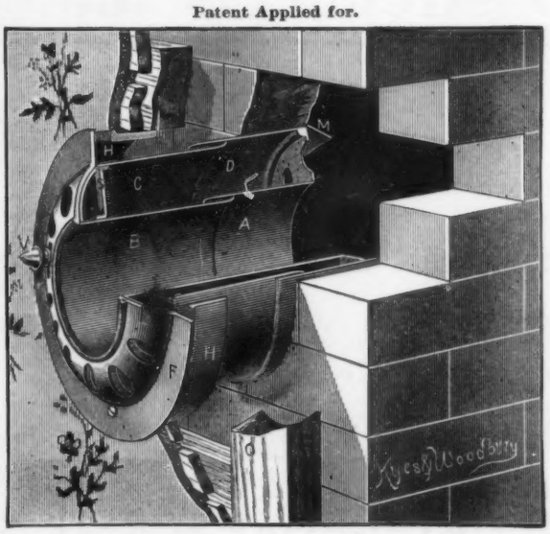
THE BOSTON WALL-PAPER CO.,

WM. A. CORSE, Manager,

20 SUMMER ST., BOSTON.

HILL'S SAFETY STOVE-PIPE THIMBLE.

Patent Applied for.



ABSOLUTELY safe against fire.
Adjustable to any thickness of brick and wood work.
Entirely independent of the walls of the room.
Latest and best in the Market.
Fully indorsed by Insurance men, Architects, and Builders.

Send for Illustrated Circulars.

Manufactured only by

HILL DRYER COMPANY,

WORCESTER, MASS.

A. G. NEWMAN, late NEWMAN & CAPRON.

MANUFACTURERS OF

Fine Bronze Hardware, Bank, Office and Stoop Railings in Bronze or Brass. Antique Furniture-Trimmings. Electrical and Mechanical Bell-Hanging Burglar-Alarms.

Warerooms, 1180 BROADWAY. Factory, 157-163 WEST 29th STREET, NEW YORK, N. Y.

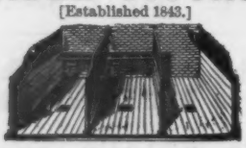
CABOT'S CREOSOTE STAIN

Is the only true exterior Stain made, all others are merely thin paints. Our stains have been in use since 1881, and have given excellent satisfaction, both as to durability and for the artistic effect they produce.

Send for Circulars and Samples.

SAMUEL CABOT, - - - - 70 Kilby St., Boston.

THE LARGEST MANUFACTURERS IN THE UNITED STATES
—OF—
STABLE FITTINGS.
[Established 1843.]



HAY RACKS, MANGERS, ETC., ETC.
Send for Prices and Catalogues.
SAMUEL S. BENT & SON,
111 Chambers St., New York.

ESTERBROOK'S STEEL PENS

FOR SALE BY ALL STATIONERS.
THE ESTERBROOK STEEL PEN CO.
20 John Street, New York, N. Y.

J. B. SHANNON & SONS,

ART METAL WORK

MANUFACTURERS OF

Bronze Grills for Front Doors.

Brass Railings for Bank and Office use.

Antique Furniture Hardware.

Brass and Bronze Door Knobs,

Correspondence Solicited. Estimates Furnished.

1020 Market Street, Philadelphia, Pa.

To Architects and Builders.

Adopt MAHOGANY for interior finish; it is the handsomest and most durable cabinet wood known, and we are prepared to furnish it at prices that compare very favorably with those ruling for other hard-woods.

Correspondence solicited.

Wm. E. UPTEGROVE & BRO., Foot E. 10th & 11th Sts., NEW YORK.